aprilia

SERVICE STATION MANUAL

854171



NA 850 Mana

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THE VALUE OF SERVICE

Thanks to continuous technical updates and specific training programs on aprilia products, only **aprilia Official Network** mechanics know this vehicle fully and have the special tools necessary to carry out maintenance and repair operations correctly.

The reliability of the vehicle also depends on its mechanical conditions. Checking the vehicle before riding, its regular maintenance and the use of **Original aprilia Spare Parts** only are essential factors!

For information about the nearest **Official Dealer and/or Service Centre**, consult the Yellow Pages or search directly on the inset map in our Official Website:

www.aprilia.com

Only aprilia Original Spare Parts ensure products already studied and tested during the vehicle design stage. All aprilia Original Spare Parts undergo quality control procedures to guarantee full reliability and duration.

The descriptions and illustrations given in this publication are not binding; While the basic characteristics as described and illustrated in this manual remain unchanged, aprilia reserves the right, at any time and without being required to update this publication beforehand, to make any changes to components, parts or accessories, which it considers necessary to improve the product or which are required for manufacturing or construction reasons.

SERVICE STATION MANUAL

NA 850 Mana

NOTE Provides key information to make the procedure easier to understand and carry out.

CAUTION Refers to specific procedures to carry out for preventing damages to the vehicle.

WARNING Refers to specific procedures to carry out to prevent injuries to the repairer.



Personal safety Failure to completely observe these instructions will result in serious risk of personal injury.



Safeguarding the environment Sections marked with this symbol indicate the correct use of the vehicle to prevent damaging the environment.



Vehicle intactness The incomplete or non-observance of these regulations leads to the risk of serious damage to the vehicle and sometimes even the invalidity of the guarantee.



INDEX OF TOPICS

INDEX OF TOPICS

Maintenance chart

EVERY 24 MONTHS

Action
Brake fluid - Change
Coolant - Change
Fork oil - Change

EVERY 4 YEARS

Action
Fuel pipes - Replace

AT 1000 KM (621 MI)

Action
Drive chain - Check and lubricate
Transmission cables - Check, adjust and grease, or replace if necessary
Diagnosis for engine control unit and transmission ECU - Check
Brake discs - Check and clean, replace if necessary.
General vehicle operation - Check
Break pads - Check and replace if necessary
Lights circuit - Check, adjust aiming or replace if necessary
Brake fluid - Check, top-up or change if necessary.
Coolant - Check, top-up or change if necessary
Tyres - Check and replace if necessary
Tyre pressure - Adjust
Bolts, nuts and screws tightening - Check and restore tightening torque
Transmission gears and anti-vibration buffer - Check, check tightening, adjust and replace if necessary
Suspensions and setting - Check and adjust if necessary
Braking systems - Check
Safety switches - Check
Fork oil seals - Check and clean, replace if necessary
Parking brake calliper - Check and adjust if necessary
Steering bearings and steering clearance - Check and clean, adjust, grease or replace if necessary
Battery - Check terminal tightening

EVERY 2000 KM (1243 MI)

Action
Break pads - Check and replace if necessary

AT 10000 KM (6214 MI)

Action
Engine oil - Change
Engine oil filter - Replace
Air filter - Clean
Transmission air filter - Clean
Final transmission (chain, crown and pinion) - Check and clean, adjust, grease or replace if necessary
Transmission cables - Check, adjust and grease, or replace if necessary
Steering bearings and steering clearance - Check and clean, adjust, grease or replace if necessary
Diagnosis for engine control unit and transmission ECU - Check
Brake discs - Check and clean, replace if necessary.
Parking brake calliper - Check and adjust if necessary
General vehicle operation - Check
Break pads - Check and replace if necessary
Lights circuit - Check, adjust aiming or replace if necessary
Brake fluid - Check, top-up or change if necessary.
Coolant - Check, top-up or change if necessary
Tyres - Check and replace if necessary
Tyre pressure - Adjust
Bolts, nuts and screws tightening - Check and restore tightening torque
Transmission gears and anti-vibration buffer - Check, check tightening, adjust and replace if necessary
Suspensions and setting - Check and adjust if necessary
Braking systems - Check
Safety switches - Check
Fork oil seals - Check and clean, replace if necessary
Battery - Check terminal tightening
Fuel pipes - Check and clean, replace if necessary
Wheel bearings - Check and clean, adjust, grease or replace if necessary
Transmission bolts, nuts and screws tightening - Check and restore tightening torque

AT 20000 KM (12427 MI)

Action
Engine oil - Change
Drive belt - Replacement
Variator sliders - Replace
Transmission air filter - Clean
Air filter - Replace
Final transmission (chain, crown and pinion) - Check and clean, adjust, grease or replace if necessary
Transmission cables - Check, adjust and grease, or replace if necessary
Steering bearings and steering clearance - Check and clean, adjust, grease or replace if necessary
Diagnosis for engine control unit and transmission ECU - Check
Brake discs - Check and clean, replace if necessary.
General vehicle operation - Check
Parking brake calliper - Check and adjust if necessary
Spark plug - Replace
Break pads - Check and replace if necessary
Lights circuit - Check, adjust aiming or replace if necessary
Brake fluid - Check, top-up or change if necessary.
Coolant - Check, top-up or change if necessary
Tyres - Check and replace if necessary
Tyre pressure - Adjust
Bolts, nuts and screws tightening - Check and restore tightening torque
Transmission gears and anti-vibration buffer - Check, check tightening, adjust and replace if necessary
Suspensions and setting - Check and adjust if necessary
Braking systems - Check
Safety switches - Check
Fork oil seals - Check and clean, replace if necessary
Battery - Check terminal tightening
Fuel pipes - Check and clean, replace if necessary
Wheel bearings - Check and clean, adjust, grease or replace if necessary
Transmission bolts, nuts and screws tightening - Check and restore tightening torque

At 30000 km (18641 mi)

Action
Engine oil - Change
Engine oil filter - Replace

Action
Air filter - Clean
Transmission air filter - Clean
Final transmission (chain, crown and pinion) - Replace
Transmission cables - Check, adjust and grease, or replace if necessary
Steering bearings and steering clearance - Check and clean, adjust, grease or replace if necessary
Diagnosis for engine control unit and transmission ECU - Check
Brake discs - Check and clean, replace if necessary.
General vehicle operation - Check
Break pads - Check and replace if necessary
Lights circuit - Check, adjust aiming or replace if necessary
Brake fluid - Check, top-up or change if necessary.
Throttle body - Clean and reset the self-adjustable parameters using a diagnosis instrument
Parking brake calliper - Check and adjust if necessary
Tappet clearance - Check and adjust
Coolant - Check, top-up or change if necessary
Tyres - Check and replace if necessary
Tyre pressure - Adjust
Bolts, nuts and screws tightening - Check and restore tightening torque
Transmission gears and anti-vibration buffer - Check, check tightening, adjust and replace if necessary
Suspensions and setting - Check and adjust if necessary
Braking systems - Check
Safety switches - Check
Fork oil seals - Check and clean, replace if necessary
Battery - Check terminal tightening
Fuel pipes - Check and clean, replace if necessary
Wheel bearings - Check and clean, adjust, grease or replace if necessary
Transmission bolts, nuts and screws tightening - Check and restore tightening torque

At 40000 km (24855 mi)

Action
Engine oil - Change
Drive belt - Replacement
Variator sliders - Replace
Transmission air filter - Clean

Action
Air filter - Replace
Final transmission (chain, crown and pinion) - Check and clean, adjust, grease or replace if necessary
Transmission cables - Check, adjust and grease, or replace if necessary
Steering bearings and steering clearance - Check and clean, adjust, grease or replace if necessary
Diagnosis for engine control unit and transmission ECU - Check
Brake discs - Check and clean, replace if necessary.
General vehicle operation - Check
Break pads - Check and replace if necessary
Lights circuit - Check, adjust aiming or replace if necessary
Brake fluid - Check, top-up or change if necessary.
Coolant - Check, top-up or change if necessary
Spark plug - Replace
Tyres - Check and replace if necessary
Tyre pressure - Adjust
Bolts, nuts and screws tightening - Check and restore tightening torque
Transmission gears and anti-vibration buffer - Check, check tightening, adjust and replace if necessary
Suspensions and setting - Check and adjust if necessary
Braking systems - Check
Safety switches - Check
Fork oil seals - Check and clean, replace if necessary
Battery - Check terminal tightening
Fuel pipes - Check and clean, replace if necessary
Wheel bearings - Check and clean, adjust, grease or replace if necessary
Parking brake calliper - Check and adjust if necessary
Transmission bolts, nuts and screws tightening - Check and restore tightening torque

At 50000 km (34069 mi)

Action
Engine oil - Change
Engine oil filter - Replace
Air filter - Clean
Transmission air filter - Clean
Final transmission (chain, crown and pinion) - Check and clean, adjust, grease or replace if necessary

Action
Transmission cables - Check, adjust and grease, or replace if necessary
Steering bearings and steering clearance - Check and clean, adjust, grease or replace if necessary
Diagnosis for engine control unit and transmission ECU - Check
Brake discs - Check and clean, replace if necessary.
General vehicle operation - Check
Break pads - Check and replace if necessary
Lights circuit - Check, adjust aiming or replace if necessary
Brake fluid - Check, top-up or change if necessary.
Coolant - Check, top-up or change if necessary
Tyres - Check and replace if necessary
Tyre pressure - Adjust
Bolts, nuts and screws tightening - Check and restore tightening torque
Transmission gears and anti-vibration buffer - Check, check tightening, adjust and replace if necessary
Suspensions and setting - Check and adjust if necessary
Braking systems - Check
Safety switches - Check
Fork oil seals - Check and clean, replace if necessary
Battery - Check terminal tightening
Fuel pipes - Check and clean, replace if necessary
Wheel bearings - Check and clean, adjust, grease or replace if necessary
Parking brake calliper - Check and adjust if necessary
Transmission bolts, nuts and screws tightening - Check and restore tightening torque

AT 60000 KM (37282 MI)

Action
Engine oil - Change
Drive belt - Replacement
Variator sliders - Replace
Spark plug - Replace
Transmission air filter - Clean
Air filter - Replace
Throttle body - Clean and reset the self-adjustable parameters using a diagnosis instrument
Tappet clearance - Check and adjust
Final transmission (chain, crown and pinion) - Replace

Action
Transmission cables - Check, adjust and grease, or replace if necessary
Steering bearings and steering clearance - Check and clean, adjust, grease or replace if necessary
Diagnosis for engine control unit and transmission ECU - Check
Brake discs - Check and clean, replace if necessary.
General vehicle operation - Check
Break pads - Check and replace if necessary
Lights circuit - Check, adjust aiming or replace if necessary
Brake fluid - Check, top-up or change if necessary.
Coolant - Check, top-up or change if necessary
Tyres - Check and replace if necessary
Tyre pressure - Adjust
Bolts, nuts and screws tightening - Check and restore tightening torque
Transmission gears and anti-vibration buffer - Check, check tightening, adjust and replace if necessary
Suspensions and setting - Check and adjust if necessary
Braking systems - Check
Safety switches - Check
Fork oil seals - Check and clean, replace if necessary
Battery - Check terminal tightening
Fuel pipes - Check and clean, replace if necessary
Wheel bearings - Check and clean, adjust, grease or replace if necessary
Parking brake calliper - Check and adjust if necessary
Transmission bolts, nuts and screws tightening - Check and restore tightening torque

At 70000 km (43496 mi)

Action
Engine oil - Change
Engine oil filter - Replace
Air filter - Clean
Transmission air filter - Clean
Final transmission (chain, crown and pinion) - Check and clean, adjust, grease or replace if necessary
Transmission cables - Check, adjust and grease, or replace if necessary
Steering bearings and steering clearance - Check and clean, adjust, grease or replace if necessary
Diagnosis for engine control unit and transmission ECU - Check
Brake discs - Check and clean, replace if necessary.

Action
General vehicle operation - Check
Break pads - Check and replace if necessary
Lights circuit - Check, adjust aiming or replace if necessary
Brake fluid - Check, top-up or change if necessary.
Coolant - Check, top-up or change if necessary
Tyres - Check and replace if necessary
Tyre pressure - Adjust
Bolts, nuts and screws tightening - Check and restore tightening torque
Transmission gears and anti-vibration buffer - Check, check tightening, adjust and replace if necessary
Suspensions and setting - Check and adjust if necessary
Braking systems - Check
Safety switches - Check
Fork oil seals - Check and clean, replace if necessary
Battery - Check terminal tightening
Fuel pipes - Check and clean, replace if necessary
Wheel bearings - Check and clean, adjust, grease or replace if necessary
Parking brake calliper - Check and adjust if necessary
Transmission bolts, nuts and screws tightening - Check and restore tightening torque

At 80000 km (49710 mi)

Action
Engine oil - Change
Drive belt - Replacement
Variator sliders - Replace
Spark plug - Replace
Transmission air filter - Clean
Air filter - Replace
Tappet clearance - Check and adjust
Final transmission (chain, crown and pinion) - Check and clean, adjust, grease or replace if necessary
Transmission cables - Check, adjust and grease, or replace if necessary
Steering bearings and steering clearance - Check and clean, adjust, grease or replace if necessary
Diagnosis for engine control unit and transmission ECU - Check
Brake discs - Check and clean, replace if necessary.
General vehicle operation - Check

Action
Break pads - Check and replace if necessary
Lights circuit - Check, adjust aiming or replace if necessary
Brake fluid - Check, top-up or change if necessary.
Coolant - Check, top-up or change if necessary
Tyres - Check and replace if necessary
Tyre pressure - Adjust
Bolts, nuts and screws tightening - Check and restore tightening torque
Transmission gears and anti-vibration buffer - Check, check tightening, adjust and replace if necessary
Suspensions and setting - Check and adjust if necessary
Braking systems - Check
Safety switches - Check
Fork oil seals - Check and clean, replace if necessary
Battery - Check terminal tightening
Fuel pipes - Check and clean, replace if necessary
Wheel bearings - Check and clean, adjust, grease or replace if necessary
Parking brake calliper - Check and adjust if necessary
Transmission bolts, nuts and screws tightening - Check and restore tightening torque

Spark plug

At regular intervals, remove the spark plug and clean off any carbon deposits or replace as required.

CAUTION

ALWAYS REPLACE BOTH SPARK PLUGS, EVEN IF ONLY ONE NEEDS REPLACING.

In order to gain access to the spark plugs:

CAUTION

BEFORE CARRYING OUT THE FOLLOWING OPERATIONS AND IN ORDER TO AVOID BURNS, LEAVE THE ENGINE AND MUFFLER TO COOL OFF TO AMBIENT TEMPERATURE.

- Working from both sides, remove the two spark plug tubes.
- With the specific supplied wrench, unscrew and remove the spark plugs

(two per cylinder).

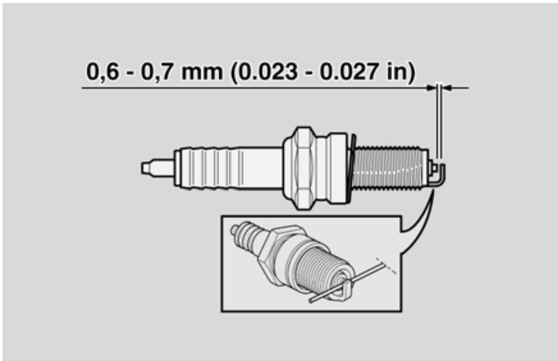




- Check the gap between the electrodes with a feeler thickness gauge.

CAUTION

DO NOT ATTEMPT TO READJUST THE ELECTRODE GAP.

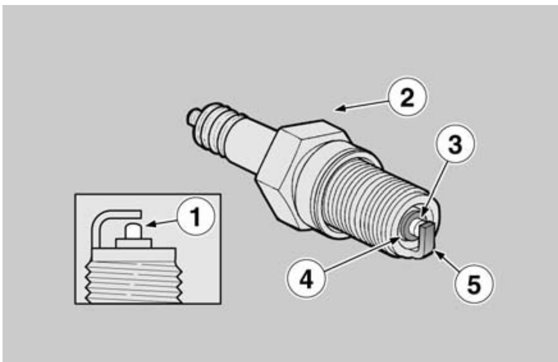


The gap between the electrodes should be between 0.7 ÷ 0.8 mm (0.027 ÷ 0.031 in). Otherwise, replace the spark plug (2).

- Make sure the washer is in good conditions.

Installation:

- Once the washer is fitted, screw the spark plug (2) carefully to avoid damaging the thread.
- Tighten using the spanner supplied in the tool kit. Make each spark plug (2)



complete 1/2 of a turn to compress the washer.

CAUTION

IT IS ESSENTIAL TO TIGHTEN THE SPARK PLUG (2) PROPERLY. A LOOSE SPARK PLUG MAY CAUSE ENGINE OVERHEATING AND RESULT IN SEVERE DAMAGE.

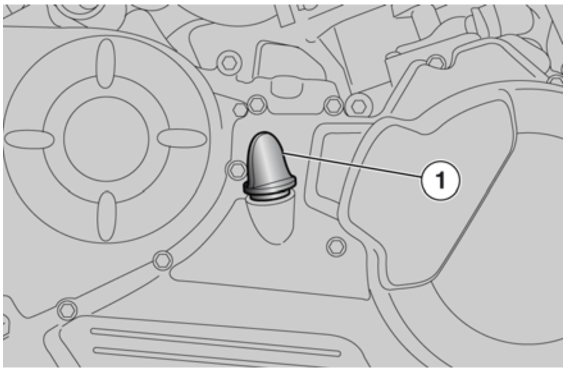
Locking torques (N*m)

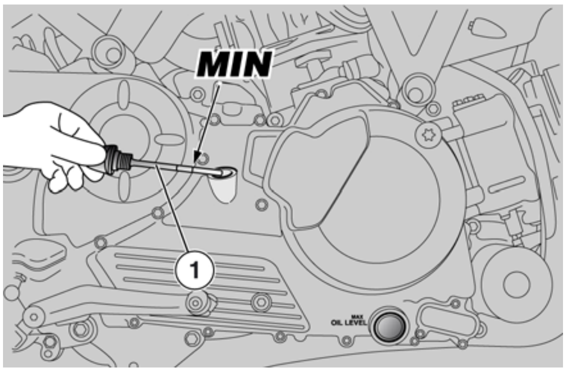
Spark plug (2) 13 Nm (9.59 lbf ft)

Engine oil

Check

Check the engine oil level frequently.





NOTE

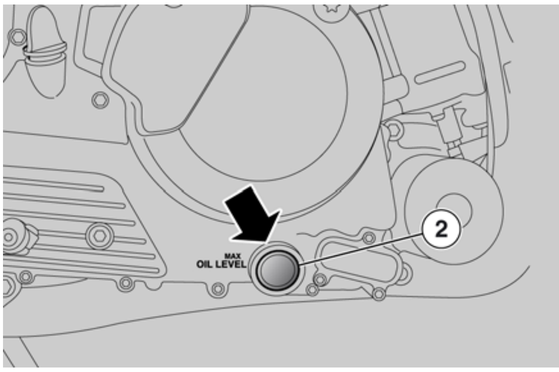
CARRY OUT THE MAINTENANCE OPERATIONS AT HALF THE INTERVALS SHOWN IF THE VEHICLE IS USED IN WET OR DUSTY AREAS, OFF ROAD OR FOR SPORTS APPLICATIONS.

CAUTION

CHECK ENGINE OIL LEVEL WHEN THE ENGINE IS WARM, WITH THE VEHICLE PERFECTLY UPRIGHT, WITH BOTH WHEELS ON THE GROUND, ON A SOLID AND LEVEL SURFACE.

NOTE

DO NOT LET THE ENGINE IDLE WHEN THE VEHICLE IS AT STANDSTILL TO WARM UP THE ENGINE AND OBTAIN THE OPERATING TEMPERATURE OF ENGINE OIL.
OIL IS BEST CHECKED AFTER A TRIP OR AFTER TRAVELLING APPROXIMATELY 15 km (10 mi), OUT OF TOWN (ENOUGH TO WARM UP ENGINE OIL TO OPERATING TEMPERATURE).
IT IS IMPORTANT TO MEASURE THE ENGINE OIL MINIMUM LEVEL USING THE DIPSTICK (1), AND THE ENGINE OIL MAXIMUM LEVEL THROUGH THE CRANKCASE SIGHT GLASS (2).



- Shut off the engine.
- Keep the vehicle upright with both wheels on the ground.
- Unscrew and remove the filler cap (1) and check the oil level through the dipstick.
- The level should be above the minimum level marked on the cap-dipstick (1).
- Top up if the oil level is close to or below the reference mark on the dipstick.

Replacement

CHANGING ENGINE OIL AND REPLACING THE ENGINE OIL FILTER CAN PROVE DIFFICULT IF YOUR ARE INEXPERIENCED.
CONTACT AN OFFICIAL aprilia dealer IF REQUIRED.
IF YOU WISH TO PERFORM THESE OPERATIONS YOURSELF, FOLLOW THESE INSTRUCTIONS.

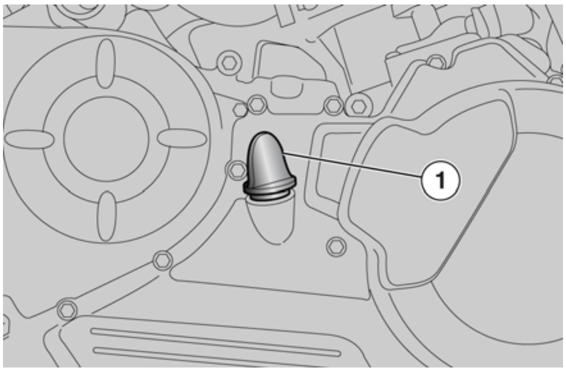
Check the engine oil level frequently.

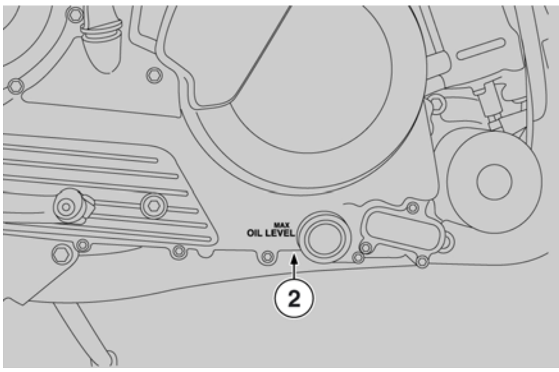
To change the oil:

CAUTION

HOT OIL IS MORE FLUID AND WILL DRAIN OUT MORE EASILY AND COMPLETELY; IDEAL TEMPERATURE IS REACHED AFTER THE ENGINE HAS RUN FOR ABOUT TWENTY MINUTES.

OIL BECOMES VERY HOT WHEN THE ENGINE IS HOT; BE CAREFUL NOT TO GET BURNED WHEN CARRYING OUT THE OPERATIONS DESCRIBED BELOW.





- Use a cloth to wipe off any mud deposit on the area next to the filler plug (1).
- Place a container with + 4000 cm³ (244 cu.in) capacity under the drainage plug (2).
- Unscrew and remove the drainage plug (2).
- Unscrew and remove the filler plug (1).
- Drain the oil into the container; allow several minutes for oil to drain out completely.
- Replace the sealing washer of the drainage plug and the O-ring of the cap (2).
- Screw and tighten the drainage plug (2).

Locking torques (N*m)

Engine oil drainage plug - M16x1.5 (1) 21 - 29 Nm (15.49 - 21.39 lbf ft)

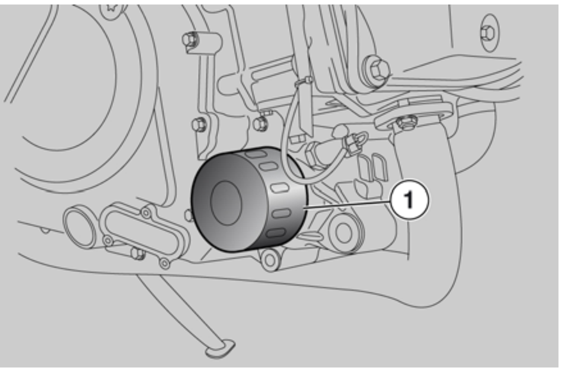
Engine oil filter

ENGINE OIL FILTER REPLACEMENT

- Replace the engine oil filter (1) at the intervals specified in the routine maintenance table.
- Remove the engine oil filter (1).

Never reuse an old filter.

- Screw the new engine oil filter (1).

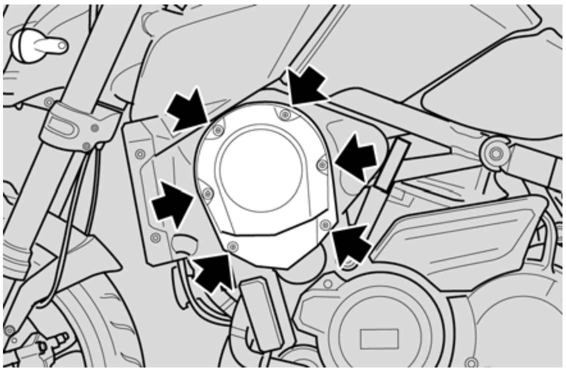


Locking torques (N*m)

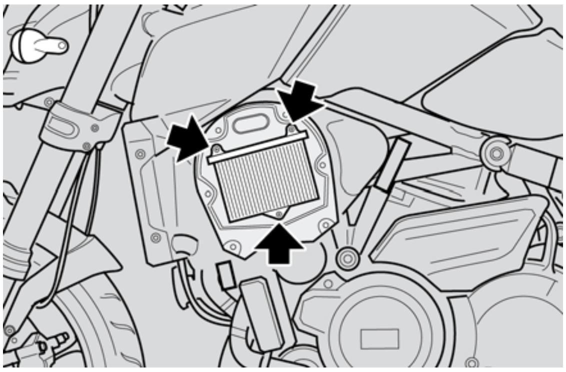
Engine oil filter (1) 16 Nm (11.80 lbf ft)

Air filter

- Undo and remove the six screws fixing the filter casing cover.
- Remove the filter casing cover.
- Undo and remove the three screws fixing the air filter.
- Remove the air filter.



COVER THE HOLE WITH A CLEAN CLOTH SO THAT NO FOREIGN ELEMENTS GET INTO THE INLET DUCTS.



INDEX OF TOPICS

Electrical system installation

INTRODUCTION

Scope and applicability

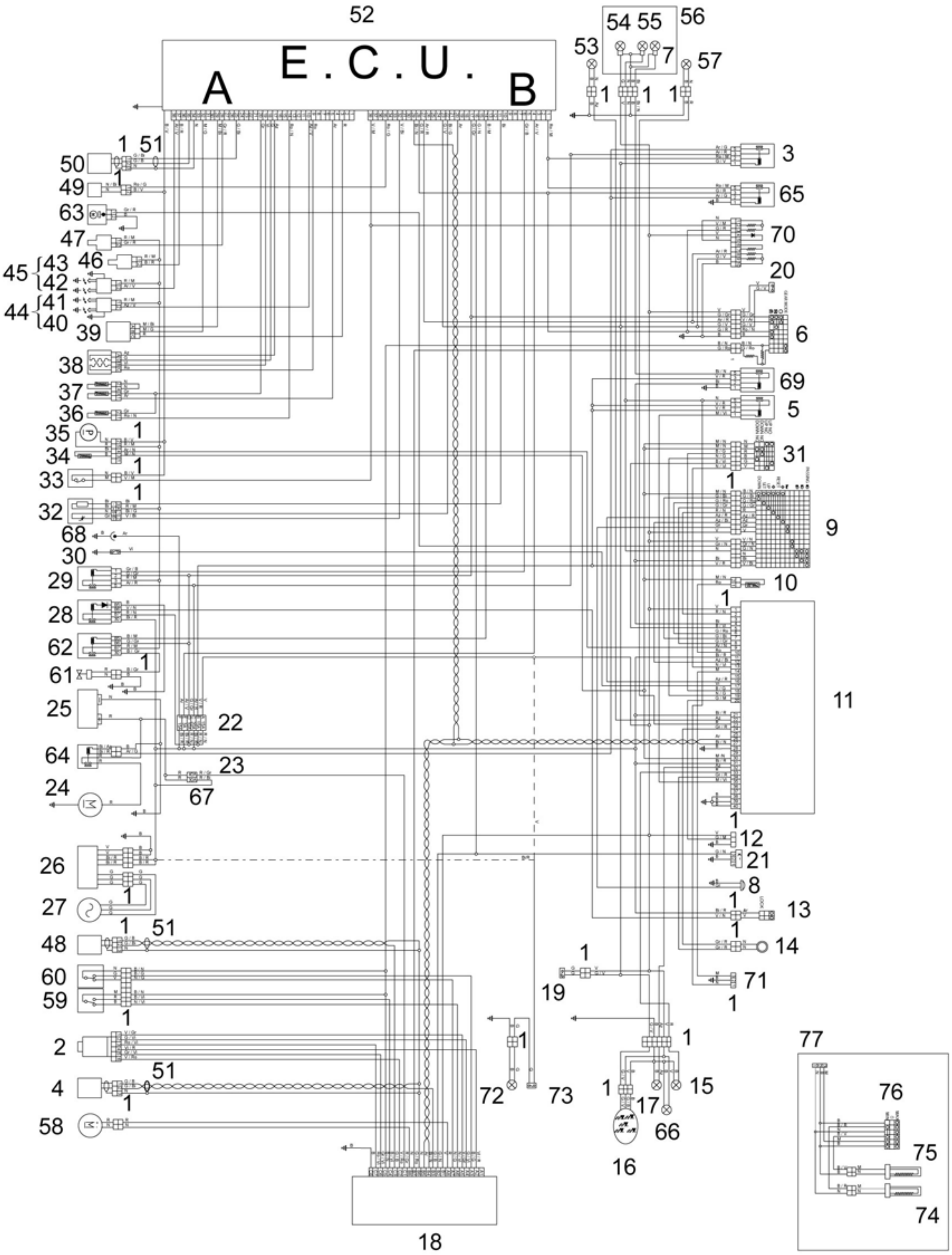
The position of the cable harnesses, how they are fixed to the motorcycle and potential problems are defined on the following sections in order to reach the objectives of vehicle reliability.

Materials used and corresponding quantities

The electrical system consists of the following cable harnesses and parts:

- 1 Main cable harness, Drw. 851633
- 1 Filter casing cable harness, Drw. 853434
- 1 Rear light cable harness, Drw. 853435
- 1 Relay-Starter cable, Drw. 851630
- 1 Battery ground lead-Engine cable, Drw. 851632
- 2 Hoods for Magura switches, Code 8220135
- 1 Injection main relay, Code 8124869
- 6 12 V / 30 A relays, Code 8224462
- 1 Start-up relay, Code 8112927
- Medium black clamps, 178x4, Code 8120416
- Small black clamps, 98x2.5, Code 2120422
- 1 10-cm spiral for start-up cable Code 8220709
- 1 Pick-Up divider cable harness (if fitted), Code 858194

General wiring diagram



KEY

1. MULTIPLE CONNECTORS
2. PULLEY POSITION SENSOR
3. START-UP RELAY
4. PULLEY SPEED SENSOR
5. LIGHT LOGIC RELAY

6. RIGHT LIGHT SWITCH
7. HIGH-BEAM BULB
8. HORN
9. LEFT LIGHT SWITCH
10. AMBIENT AIR TEMPERATURE SENSOR
11. INSTRUMENT PANEL
12. INSTRUMENT PANEL DIAGNOSTICS
13. KEY SWITCH
14. IMMOBILIZER AERIAL
15. REAR RIGHT TURN INDICATOR
16. REAR LIGHT ASSEMBLY
17. REAR LEFT TURN INDICATOR
18. CVT CONTROL UNIT
19. REAR STOP SWITCH
20. FRONT STOP SWITCH
21. ECU DIAGNOSIS CONNECTOR
22. AUXILIARY FUSES
23. AUTOMATIC TRANSMISSION FUSE
24. STARTER MOTOR
25. BATTERY
26. VOLTAGE REGULATOR
27. GENERATOR
28. INJECTION MAIN RELAY
29. INJECTION LOAD RELAY
30. OIL PRESSURE BULB
31. GEARSHIFT SWITCH ON HANDLEBAR
32. LAMBDA PROBE
33. SIDE STAND SWITCH
34. FUEL RESERVE SENSOR (PIC)
35. FUEL PUMP
36. INTAKE AIR TEMPERATURE SENSOR
37. WATER TEMPERATURE SENSOR
38. AUTOMATIC AIR
39. THROTTLE SENSOR
40. FRONT CYLINDER INNER SPARK PLUG

41.FRONT CYLINDER OUTER SPARK PLUG
42.REAR CYLINDER INNER SPARK PLUG
43.REAR CYLINDER OUTER SPARK PLUG
44.FRONT CYLINDER DOUBLE COIL
45.REAR CYLINDER DOUBLE COIL
46.FRONT CYLINDER INJECTOR
47.REAR CYLINDER INJECTOR
48.PINION SPEED SENSOR
49.FALL SENSOR
50.PICK-UP
51.PICK-UP WIRE SHIELDING
52.ECU
53.FRONT LEFT TURN INDICATOR
54.TAIL LIGHT BULB
55.LOW-BEAM BULB
56.HEADLIGHT
57.RIGHT FRONT TURN INDICATOR
58.CVT MOTOR
59.GEAR DOWNSHIFT PEDAL SWITCH
60.GEAR UPSHIFT PEDAL SWITCH
61.FAN
62.FAN CONTROL RELAY
63.ELECTRIC LOCK
64.START-UP REMOTE CONTROL
65.RETENTION RELAY
66.LICENSE PLATE LIGHT
67.MAIN FUSE
68.PLUG SOCKET
69.HIGH-BEAM LIGHT RELAY
70.RESISTANCE MODULE
71.HEATED HAND GRIP CONNECTOR
72.GLOVE-BOX LIGHT
73.GLOVE-BOX LIGHT SWITCH
74.HEATED HAND GRIPS (OPTIONAL)
75.HEATED HAND GRIPS (OPTIONAL)

76.HAND GRIP CONTROL LIGHT SWITCH (OPTIONAL)

77.HEATED HAND GRIP UNIT (OPTIONAL)

CAUTION

THE ELECTRICAL SYSTEM IN THIS VEHICLE CAN BE SLIGHTLY DIFFERENT, DEPENDING ON THE SERIAL NUMBER, SPECIFICALLY IN THE LAYOUT OF THE GLOVE-BOX LIGHT SWITCH CONNECTIONS.
THE DIFFERENCES ARE HIGHLIGHTED ON THE DIAGRAM BY TWO TYPES OF LINES, DIFFERENT AND ALTERNATE BETWEEN THEM:

- IF THERE IS A Bi/R CABLE ON THE VEHICLE, REFER TO THE PATH MARKED WITH long/short dashes
- IF THERE IS A V CABLE ON THE VEHICLE, REFER TO THE PATH MARKED WITH A UNIFORM DOTTED LINE.

Conceptual diagrams

Checks and inspections

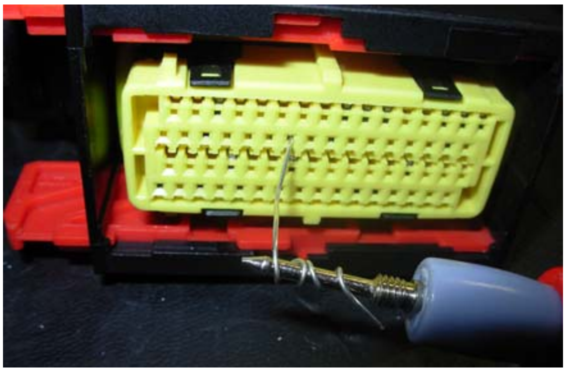
GENERAL CONCEPTS OF ELECTRICAL TROUBLESHOOTING

THE CONNECTION DIAGRAMS ARE IN THE ELECTRICAL SYSTEM SECTIONS; PAY ATTENTION TO THESE DIAGRAMS AS THEY SHOW THE CONNECTOR/COMPONENT AS VIEWED FROM THE CABLE HARNESS SIDE, THAT IS LOOKING AT THE CABLES WHEN GOING OUT OF THE "MAIN" CABLE HARNESS AND INTO THE CONNECTOR/COMPONENT.

CAUTION

BEFORE CARRYING OUT ANY TROUBLESHOOTING PROCEDURE ON THE VEHICLE, CHECK THAT THE BATTERY VOLTAGE IS ABOVE 12V.

CONNECTOR CHECK PROCEDURE



The procedure includes the following checks:

1. Observation and check of the connector position on the component or on the coupling connector, making sure that the locking catch is released.

2. Observation of the terminals on the connector: no rust marks or dirt should be present and it is important to check terminal correct positioning on the connector (i.e., all terminals aligned at the same depth) and terminal integrity (i.e., that terminals are not loose, open/bent, etc.). For con-

nectors whose terminals are not visible (e.g. Marelli control unit) use a metal cable of suitable diameter and introduce it carefully in the connector slot at the same depth as for the other terminals of the connector.

CAUTION

IN CASE OF TEMPORAL MALFUNCTIONING, CARRY OUT ALL DUE CHECKS LOOKING FOR FAILURES BY MOVING SLIGHTLY THE CABLE HARNESS BEING INSPECTED.

3. Pulling the cables slightly from the back of the connector in order to check the correct position of the terminals on the connector and of the cable on the terminal.

CONTINUITY check

Check goal: this control is to check that there are not any circuit interruptions nor excessive resistance, for instance caused by rust, on the two terminals being inspected.

Tester: set the tester on the "continuity" symbol and place the tester probes on the two circuit ends: the tester emits a sound signal only if there is continuity; the tester can also be set to the Ohm symbol to check that the circuit resistance is null or a few tenths of an Ohm.

CAUTION: THE CIRCUIT SHOULD NOT BE ENERGISED, OTHERWISE THE TEST IS IRRELEVANT.

GROUND CONNECTION check

Check goal: this control is to check if a cable or a circuit is in contact with the vehicle ground (-) connection.

Tester: set the tester on the "continuity" symbol and place one tester probe on the vehicle ground connection (or on the battery - terminal) and the other probe on the cable being inspected: the tester sends out a sound signal only if there is continuity. The tester can also be set to the Ohm symbol to check that the circuit resistance is null or a few tenths of an Ohm.

CAUTION! IF THERE IS A GROUND CONNECTION COMING FROM THE CONTROL UNIT, MAKE SURE THAT DURING THE TEST THE CONTROL UNIT IS EARTH CONNECTED TO THE CIRCUIT.

VOLTAGE check

Check goal: this control is to check if a cable is energised, i.e. if it receives power supply from the battery or the control unit.

Tester: set the tester on the direct current symbol and place the tester red probe on the cable being inspected and the black probe on the vehicle ground connection (or on the battery - terminal).

CAUTION

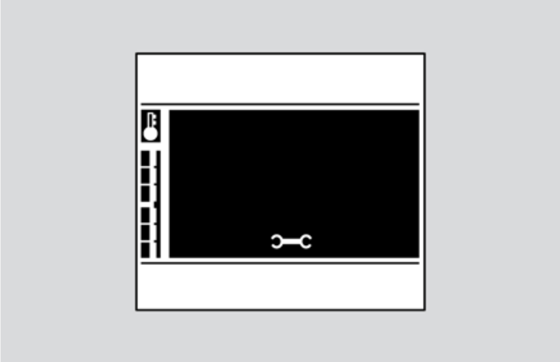
IN CASE OF TEMPORAL MALFUNCTIONING, CARRY OUT ALL DUE CHECKS LOOKING FOR FAILURES BY MOVING SLIGHTLY THE CABLE HARNESS BEING INSPECTED.

Dashboard

In case of failure, a different icon is displayed according to the cause at the bottom of the display.

SERVICE ALARM

In case of failure found in the instrument panel or in the electronic control unit, the instrument panel signals the failure by displaying the SERVICE icon and the red general warning light comes on. Given this, and for some kinds of problems, the engine can be started only if the side stand is up.

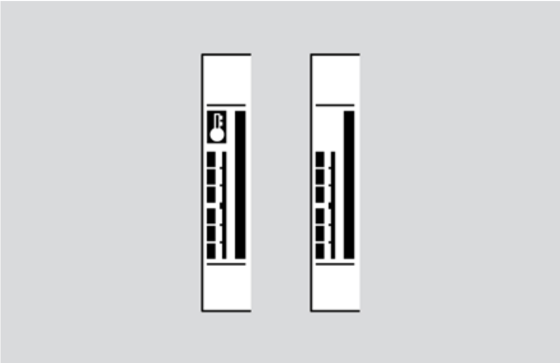




If there is an immobilizer failure at ignition, the instrument panel requests you to enter a user code. If the code is entered correctly, the instrument panel signals the failure by displaying the SERVICE icon and the red general warning light comes on.

Air temperature sensor fault

In case of air temperature sensor fault, the instrument panel signals the problem by displaying the "--" symbol steadily at the position where the temperature value is generally displayed. In this case the red general warning light does not turn on.



Oil failure

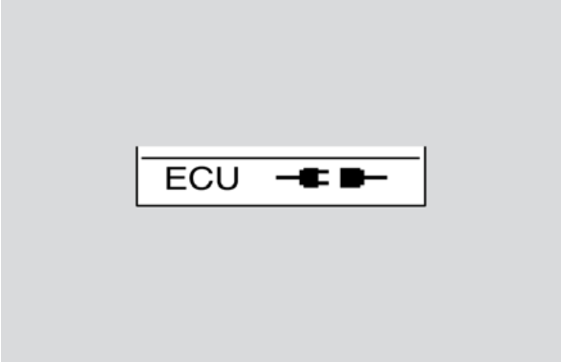
In case of failing oil pressure or oil pressure sensor fault, the bulb and the red general warning light on the instrument panel come on.

Engine overheating alarm

The engine overheating alarm is activated when the temperature is higher than or equal to 110 °C (230 °F). The red general warning light turns on and the thermometer icon flashes on the display to signal this condition.

Electronic control unit disconnected alarm

In case no connection is detected, the disconnection icon is displayed on the instrument panel and the red general warning light turns on to signal this condition.



Turn indicator alarms

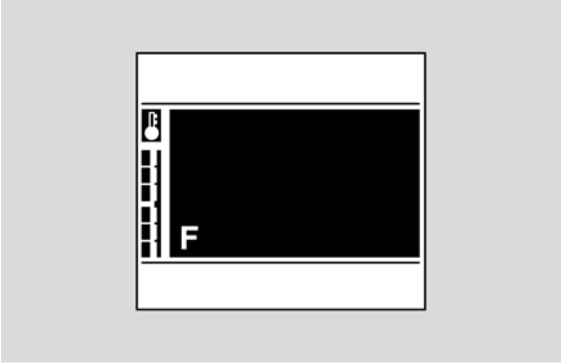
When the instrument panel detects a failing turn indicator, the turn indicator warning light flashes twice as fast and the problem is signalled on the digital display.

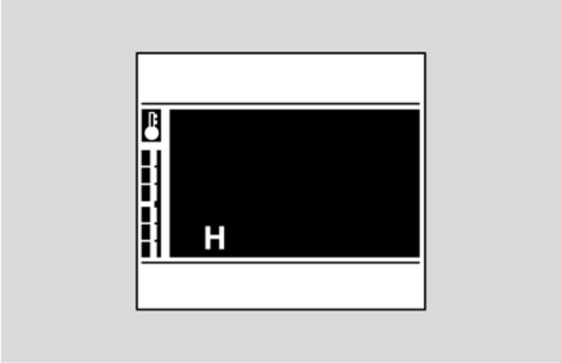


Alarms - transmission

In case of alarms for gearshift controls and mode control connected to the transmission ECU, three kinds of symbols are shown on the display, according to the nature of the alarm: F, H and M. F stands for "foot" (foot control), H stands for "handlebar" (handlebar control) and M is for "mode" (gear mode selection).

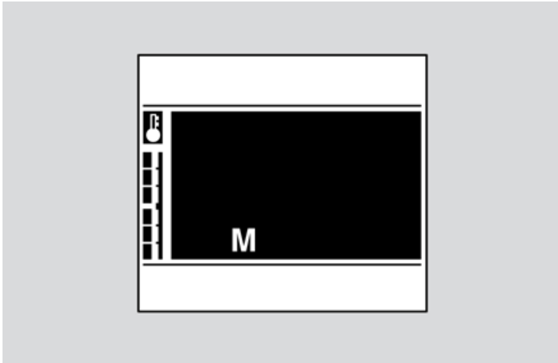
In case of alarms related to the transmission ECU, the general alarm warning light is lit and the display shows the word GEAR.





CAUTION

IN CASE THE HANDLEBAR CONTROLS ARE DISABLED, THE H SYMBOL WILL BE ALSO SHOWN ON THE DIGITAL DISPLAY.



Worn belt alarm

The alarm for a worn belt indicates excessive wear for that belt. There are two priority levels:

- Low-priority alarm: the display shows the word BELT but the alarm warning light is off.
- High-priority alarm: the display shows the word BELT and the alarm warning light comes on simultaneously.

For high-priority alarms, the RAIN mode is automatically set (see the **Transmission** chapter).

ABS alarm (for vehicles fitted with this device)

For alarms related to the ABS control unit, the general alarm warning light is lit and the display shows the word ABS

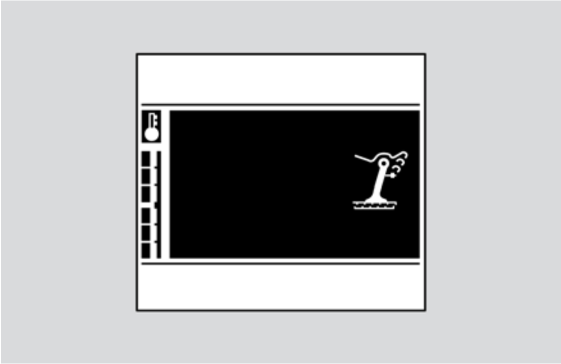
Side stand alarm

If the side stand is down, the display shows the stand icon.









Diagnosis

An access code is required to enter this menu which controls the diagnosis function:

- ENTER SERVICE CODE

This is a 5-digit code, fixed for each vehicle. For these vehicles, the code is:

12321

If the code is incorrect, the following message is displayed:

- INCORRECT CODE

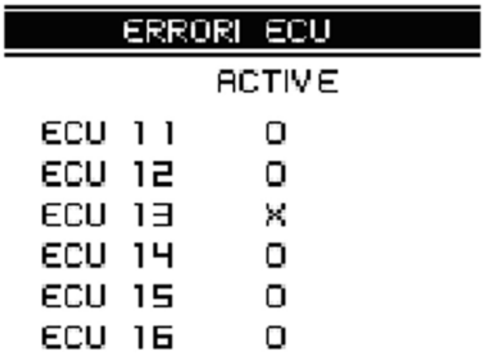
and the instrument panel goes back to the main menu. Otherwise, the following menu is displayed:

- EXIT
- ECU DIAGNOSIS
- INSTRUMENT PANEL ERRORS
- ERROR CLEARING
- VEHICLE SERVICING RESET
- UPDATE
- CHANGE KEYS
- KM / MILES

ECU DIAGNOSIS

In this mode a chart is displayed showing potential errors in the control unit.

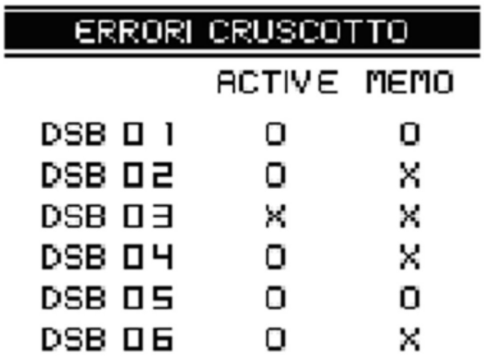
IT IS NECESSARY REFER TO THE ERROR INDICATIONS GIVEN BY AXONE FOR THIS VEHICLE.



The instrument panel does not keep all previous errors stored in its memory.

INSTRUMENT PANEL ERRORS

In this mode, a chart is displayed showing potential errors in the immobilizer and the sensors connected to it.



Instrument panel errors

In this mode, a chart is displayed showing potential errors in the immobilizer and the sensors connected to it.

DSB 01 - Immobilizer failure: key code read but not recognised.

DSB 02 - Immobilizer failure: key code not read (key not present or transponder not working)

DSB 03 - Immobilizer failure: aerial not working (open or short-circuited)

DSB 04 - Internal controller failure

DSB 05 - -

DSB 06 - Ambient air temperature sensor

Error cause

- An oil sensor failure is signalled when it is detected that the sensor circuit is open or shorted to positive.

DSB 07 - Oil pressure sensor

Error cause

An oil sensor failure is signalled when, with engine off, it is detected that the sensor circuit is open.

Troubleshooting

The test is performed only once when the key is set to ON. This error is signalled by the bulb icon, and the general warning light turns on as well.

DSB 08 - Oil pressure sensor

Error cause

An oil sensor failure is signalled when, with engine running, it is detected that the sensor circuit is closed. There is an error when the general warning light turns on.

Troubleshooting

This error is signalled by the bulb icon, and the general warning light turns on as well.

The instrument panel must keep all previous errors stored in its memory.

ERROR CLEARING

This option deletes all instrument panel errors; a further confirmation is requested. Use Axone to reset ECU errors.

VEHICLE SERVICING RESET

This function is used to reset vehicle servicing. Using this function, the odometer can be reset only once within the first 200 km (124 mi) of the vehicle, provided this has not been done by the Quality Check.

UPDATE

This function is used to program the instrument panel again. This screen page shows the software version currently loaded; the LCD reads:

- INSTRUMENT PANEL DISCONNECTED. NOW CONNECT THE DIAGNOSIS INSTRUMENT.

The instrument panel will restart to work normally after the key is inserted-extracted.

CHANGE KEYS

With this function the instrument panel can update the keys. Up to 4 keys can be stored.
The user code is first requested to be entered:

- ENTER THE CODE

After entering the correct code, the following message should be shown on the display:

- INSERT THE X KEY
- INSERT THE X+1 KEY

At least one key must be programmed for the next start-ups. If no other key is inserted within 20 seconds or if there is no power or after the fourth key is programmed, the procedure finishes and all the functions of the vehicle and the instrument panel must be enabled (even if only one key has been programmed).

KM / MILES

This menu selects the unit of measurement, either for the speed or the total or partial odometers.

- KM
- MILES

LANGUAGES

Select the user interface language from this menu.

- ITALIANO
- ENGLISH
- FRANCAIS
- DEUTSCH
- ESPAGNOL

Service warning light reset

VEHICLE SERVICING RESET

This function is used to reset vehicle servicing. Using this function, the odometer can be reset only once within the first 200 km (124 mi) of the vehicle, provided this has not been done by the Quality Check.

In order to activate this function follow the instructions in the DIAGNOSIS section.

See also

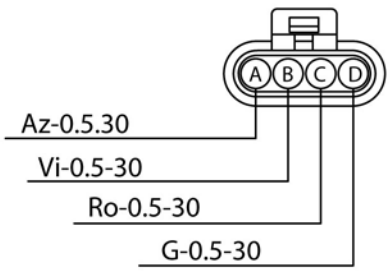
Diagnosis

Checking the idle speed adj.system

IDLE REGULATION SYSTEM CHECK

Function

It checks the air flow in the inlet manifolds by-passing the throttle valve.



Operation / Operating principle

The opening position is set by the injection control unit and is performed by means of a Stepper electrical motor.

Level in wiring diagram: Throttle and idle motor

Location:

- on the vehicle: on throttle body
- connector: on throttle body

Electrical characteristics:

- between PIN A and PIN D: 50 Ohm +/- 10 %
- between PIN B and PIN C: 50 Ohm +/- 10 %

Pin-out:

- A - 17
- B - 19
- C - 9
- D - 18

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CAUTION

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AXONE: FUEL INJECTION SYSTEM

PARAMETERS

Stepper base

Example value: 70 - 50

Steps corresponding to the idle motor reference position: approx. 70 when cold; approx. 50 when hot.

CL Stepper

Example value: 120 - 70

Steps set by the control unit for the idle motor. Steps at idle are so that the engine keeps the target engine Revs set by the control unit: approx. 90 - 120 steps when cold; approx. 70 - 90 when hot.

Stepper regulator

Difference between current steps of idle motor and those at the reference position.

Virtual throttle angle from Stepper

Example value: 0°

If the engine is not at idle speed, this value indicates the motor air flow by the idle motor in throttle degrees.

ACTIVATION

Stepper control:

For 4 s, advancement command of 32 steps; for the next 4 s, retrocession command of 32 steps and so on for 30s

ELECTRICAL ERRORS

Idle check P0505 - shorted to positive / shorted to negative / open circuit

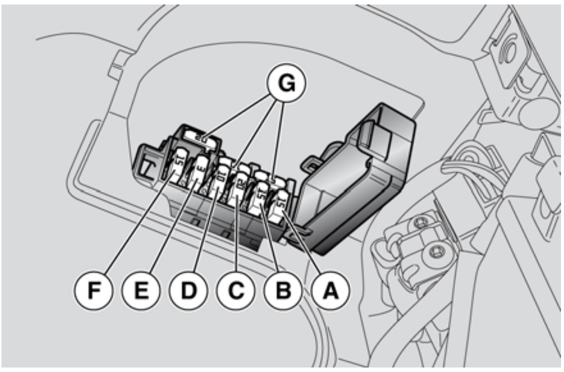
Error cause

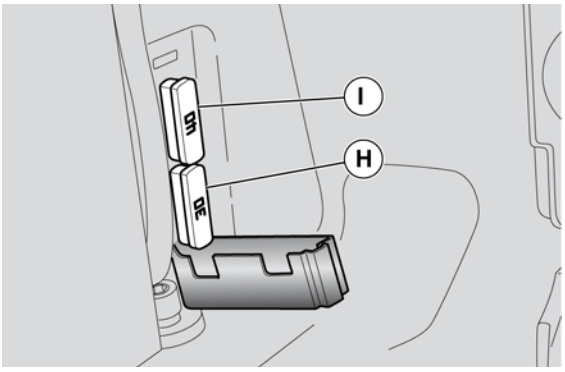
- If shorted to positive: excessive voltage has been detected at PINS 17 and 18 or PINS 9 and 19 of connector A (BROWN).
- If shorted to negative: no voltage has been detected.
- If the circuit is open: an interruption has been detected

Troubleshooting

- If shorted to positive: with the key set to key ON disconnect the idle motor connector and check if there is a voltage different from zero at the ends of one of the PINS on the cable harness side: if there is voltage, restore the cable harness.
- If shorted to negative: with the key set to key ON disconnect the idle motor connector and check which pin on the cable harness side is in continuity with the ground connection and restore the cable harness.
- If the circuit is open: disconnect the idle motor connector and check the continuity towards the motor between PINS A and D and between PINS B and C: if there is an interruption, replace the throttle body; if its OK, check the connectors of both idle motor and ECU: if they are not OK, restore; if OK, check continuity of the 4 cables and once the interrupted cable is found, restore the cable harness.

Fuses





AUXILIARY FUSES

A - Tail lights, Stop lights, License place light, Horn, Electric lock, Instrument panel power supply, Transmission ECU power supply, Resistance module (15A).

B - Low-/high-beam lights, Heated hand grips (OPT) (15 A).

C - Fuel pump, Coils, Injectors, Electric fan, Lambda probe, Start-up control relay (20A).

D - Injection load relay, Electric fan relay, Injection control unit power supply, Engine Stop (10A).

E - Injection control unit permanent power supply (3A).

F - Plug socket (15A).

G - Spare fuses (10 - 15 - 20A).

MAIN FUSES

H - Instrument panel, Turn indicators, Glove-box light, Injection main relay (30A).

E - Transmission ECU permanent power supply (40A).

Control unit

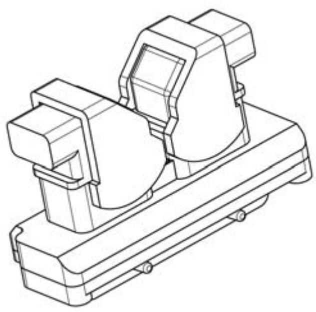
MARELLI CONTROL UNIT

Function

It manages injection/ignition, the system safety checks and the self-diagnosis function.

Location:

- Right side, under helmet compartment.



Pin-out: see the CONNECTORS section

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CAUTION

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AXONE: FUEL INJECTION SYSTEM

PARAMETERS

Target idle rpm

STATUSES

Engine status

Example value:ON/run/power-latch/stopped.

Immobilizer signal

Example value: yes/no

Indicates whether the control unit has received the consent by the instrument panel regarding the immobilizer: coded key or user code entered manually. Potential errors will be shown on the Instrument Panel Errors screen page, on the DIAGNOSIS section of the instrument panel.

IGNITION

Example value: Enabled/Disabled

Indicates whether the control unit will enable start-up when requested: in case the safety measures are not respected (side stand, neutral sensor and clutch in correct position) or if the immobilizer does not send the start-up consent to the control unit, the status is NO.

ACTIVATION

Error clearing

ELECTRICAL ERRORS

P0606 Microprocessor - circuit not operational.

Error cause

- Possible internal control unit error. Also check the control unit supply and ground connections.

Troubleshooting

- If the power supply and ground connections are connected correctly, replace the injection control unit.

CONTROL UNIT REMOVAL

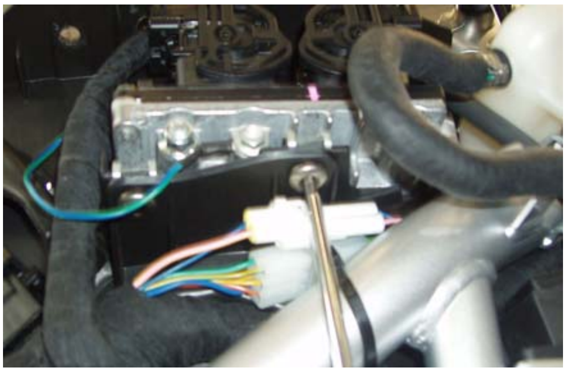
- Remove the right lower protection.
- Disconnect the connectors.



- Undo and remove the ground cable fixing screw.



- Undo and remove the two control unit fixing screws.



- Remove the control unit.

NEW CONTROL UNIT ACTIVATION PROCEDURE

- After installing a new control unit, it is necessary to carry out the Throttle positioner auto-detection function using the diagnosis instrument

Speed sensor

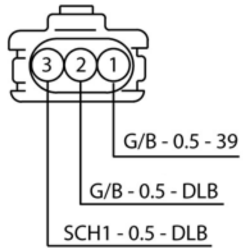
VEHICLE SPEED SENSOR

Function

To indicate the vehicle speed by reading the secondary transmission shaft rotation speed.

Operation / Operating principle

Inductive sensor: sinusoidal alternating current is generated (approximately 0.8 V in first gear at 50 km/h (31.07 mph)) for the transmission ECU reading.



Level in wiring diagram:

Speed sensor

Location:

- on the vehicle: on the rear cylinder head cover, left side.
- connector (if available): right side, under helmet compartment, on upper frame.

Electric characteristics: 0.7 - 0.8 kOhm at ambient temperature.

Pin-out:

1. Signal (Yellow/Blue)
2. Ground lead (Yellow/White)
3. Shielding

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CAUTION

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AXONE: AUTOMATIC TRANSMISSION system

PARAMETERS

Vehicle speed

Example value:km/h

To make sure that the read value is correct, check its status in the Device Status screen page.

STATUSES

Vehicle speed

Example value: Invalid data / Valid data

If the "Invalid Data" message is displayed, it means that the parameter value in the Engineering parameters screen page is not correct.

ERRORS

Vehicle speed sensor Code 9003 - no signal/ signal not valid.

Error cause

- If there is no signal: an electric circuit interruption has been detected between PINS B6 and C3 or a short-circuit has been detected in the battery. If signal is not valid: the vehicle speed has a value that is not compatible with the engine rpm or the signal is not variable.

CAUTION

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Troubleshooting

- If there is no signal: check the transmission ECU connector and the sensor connector: if it is not OK, restore; if it is OK, check the continuity of the yellow/blue cable between the transmission ECU connector and the sensor connector: if it is not OK, restore; if it is OK, check the continuity of the sensor circuit (PINS 1 and 2 of sensor connector): if it is not OK, replace the sensor; if it is OK, check the continuity between PIN 2 of the sensor connector and PIN B6 of the transmission ECU connector: if it is not OK, restore the cable harness; if it is OK, check with key set to key ON, that PIN B6 of the transmission ECU does not have continuity with the ground connection, and then replace the transmission ECU (in this case the Driven pulley revolution sensor error (Code 9004), no signal, should also be present).
- If signal is not valid: check the sensor resistance, from the transmission ECU connector, between PINS B6 and C3: if it is not OK, replace the sensor; if it is OK, with key set to key ON, check the voltage at PIN C3: if voltage is other than zero, see Phase 1; if voltage is equal to zero, carry out the same check with the engine running and by lifting the rear wheel which should be turning: if the alternating voltage is other than zero, replace the sensor; if it is approximately 0.8 V in first gear at 50 km/h, check the correct position of the sensor. Phase 1: check if upon disconnecting the sensor, voltage at PIN C3 reaches zero: if it reaches zero, replace the sensor; if it does not reach zero, restore the cable harness (yellow/blue cable shorted to battery or a cable at 5V).

Engine rpm sensor

ENGINE REVOLUTION SENSOR

Function

It tells the crankshaft position and speed to the Marelli control unit.

Operation / Operating principle

Inductive sensor: sinusoidal-type generated voltage; two teeth are missing on the flywheel for the reference position.

Level in wiring diagram: Revolution sensor

Location:

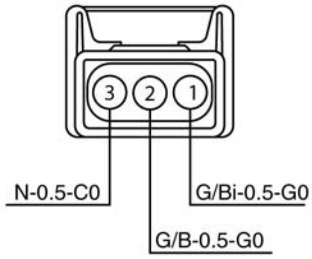
- on the vehicle: rear cylinder, internal side
- connector (if available): under the fuel tank (inside the rubber protection housing)

Electrical characteristics:

- Resistance at ambient temperature: 0.7-1.1 kOhm

Pin-out:

1. Negative signal
2. Positive signal



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CAUTION

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AXONE: FUEL INJECTION SYSTEM

PARAMETERS

Engine rpm

(rpm)

Engine revolutions per minute: the minimum value is set by the control unit and cannot be adjusted.

STATUSES

Synchronisation

Example value: Synchronised / Not synchronised

It indicates if the control unit detects the revolution sensor signal correctly.

ELECTRICAL ERRORS

Engine revolution sensor P0335 - open circuit

Error cause:

- An interruption in the sensor circuit has been detected, from PIN 25 to PIN 35 of connector A (BROWN).

Troubleshooting:

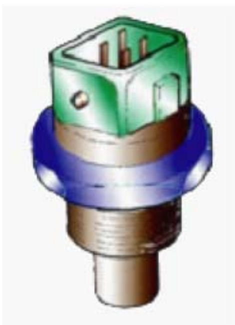
- Check the sensor connector and the injection control unit connector A (BROWN): if they are not OK, restore; if they are OK, check the continuity of the two cables- yellow/blue and yellow/white-: if there is no continuity, restore the cable harness; if there is continuity, check the interruption on the sensor and replace it.

CAUTION

IF THE ELECTRIC CIRCUIT IS IN SHORT-CIRCUIT AND NO ERRORS ARE DISPLAYED, CHECK THE SENSOR ELECTRIC CHARACTERISTIC: IF IT IS NOT THE CORRECT ONE, REPLACE THE SENSOR. IF IT IS THE CORRECT ONE, CHECK SUPPLY INSULATION AND GROUND CONNECTION INSULATION OF BOTH CABLES. CARRY OUT THE TESTS FROM THE SENSOR CONNECTOR TO THE SENSOR. IF NOT OK, RESTORE THE CABLE HARNESS OR REPLACE THE SENSOR. IF OK, PERFORM THE TEST FROM PINS 25 AND 35 OF THE MARELLI CONTROL UNIT CONNECTOR (BROWN) TO THE CABLE HARNESS.

Engine temperature sensor

ENGINE TEMPERATURE SENSOR



Function

it tells the engine temperature to the control unit so as to optimise its operation.

Operation / Operating principle

NTC type sensor (resistance sensor, inversely variable with temperature).

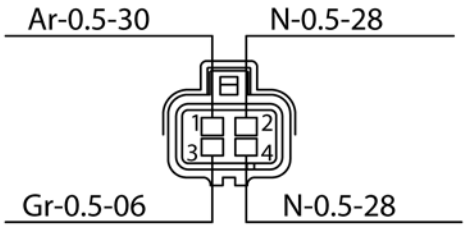
Level in wiring diagram: Temperature sensors

Location:

- on the vehicle: rear cylinder, internal

area

- connector: on the sensor



Electrical characteristics:

- Resistance at 25°: 2.05 kOhm +/- 100 Ohm
- Resistance at 60°: 575 Ohm +/- 15 Ohm
- Resistance at 90°: 230 Ohm +/- 5 Ohm

Pin-out:

- Orange: 0-5 V signal: PIN B1
- Grey: Ground connection: PIN B2

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CAUTION

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AXONE: FUEL INJECTION SYSTEM

PARAMETERS

Engine temperature

Example value: 75° C

In case of recovery, this value is set by the control unit.

ELECTRICAL ERRORS

engine temperature sensor P0115 - open circuit, shorted to positive / shorted to negative.

Error cause

- If the circuit is open, shorted to positive: excessive voltage has been detected at PIN 5 of connector A (BROWN). If shorted to negative: voltage equal to zero has been detected. In both cases, recovery function.

Troubleshooting

- If the circuit is open, shorted to positive: check the sensor connector and the Marelli con-

trol unit connector. If they are OK, check sensor continuity: replace the sensor if not OK; if it is OK, check the continuity between PIN 5 of the connector A (BROWN) and sensor PIN 1: restore cable harness if there is no continuity; if it is OK, reconnect the control unit connector and, with key set to key ON, check the continuity between the sensor connector PIN 2 and the vehicle ground connection: if it is OK, it means that the error cause is that the cable is shorted to positive and it is necessary to restore the cable harness between ENGINE PIN 5 and sensor PIN 1; if there is not continuity with the ground lead, check the sensor connector and the Marelli control unit connector; if they are not OK, restore the cable harness; if they are OK, check continuity between PIN 20 of the connector A (BROWN) and PIN 2 of the sensor connector: restore the cable harness if there is not continuity. If there is, it means that the control unit does not supply the ground connection and therefore should be replaced.

- If shorted to negative, check sensor correct resistance: if resistance is null, replace the sensor; if resistance is correct, it means that the cable has ground connection: restore the cable harness.

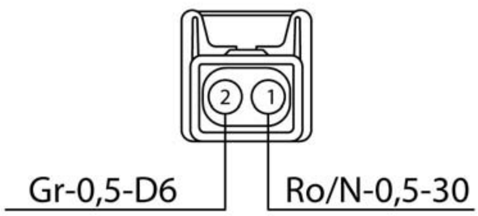
NOTES No error is detected if the sensor does not work correctly or the control unit connector or sensor terminals are rusty: then check through Axone if the temperature indicated is plausible in relation to the engine temperature. Check also that the sensor electrical characteristics are observed: replace the sensor if not OK; if it is OK, check the sensor connector and the Marelli control unit connector

Air temperature sensor

INTAKE AIR TEMPERATURE SENSOR

Function

It tells the control unit the intake air temperature in order to calculate oxygen presence so as to optimise the petrol quantity necessary for correct combustion.



Operation / Operating principle

NTC type sensor (resistance sensor, inversely variable with temperature).

Level in wiring diagram: Temperature sensors

Location:

- on the vehicle: on throttle body

- on connector sensor: on throttle body

Electrical characteristics:

- Resistance at 0°: 5.9 kΩ ± 5%
- Resistance at 10°: 3.8 kΩ ± 5%
- Resistance at 20°: 2.5 kΩ ± 5%
- Resistance at 30°: 1.7 kΩ ± 5%

Pin-out:

1. 0-5 V signal: PIN 1
2. Ground connection: PIN 2

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AXONE: FUEL INJECTION SYSTEM

PARAMETERS

Air temperature

Example value: 26° C

Temperature of the air taken in by the engine, measured by the sensor in the throttle body. This is not the temperature indicated by the instrument panel.

ELECTRICAL ERRORS

air temperature sensor P0110 - open circuit, shorted to positive / shorted to negative.

Error cause

- If the circuit is open, shorted to positive: excessive voltage has been detected at PIN 14 of connector A (BROWN). If shorted to negative: voltage equal to zero has been detected.

Troubleshooting

- If the circuit is open, shorted to positive: check the sensor connector and the Marelli control unit connector. If OK, check sensor continuity: replace the sensor if not OK; if it is OK, check continuity between PIN 14 of connector A (BROWN) and sensor PIN 1: restore cable harness if there is not continuity; if it is OK, reconnect the control unit connector

and, with key set to key ON, check the continuity between the sensor connector PIN 2 and the vehicle ground connection: if it is OK, it means that the error cause is that the cable is shorted to positive and it is necessary to restore the cable harness between PIN 14 of the connector A (BROWN) and sensor PIN 1; check the sensor connector and the Marelli control unit connector. If they are not OK, restore the cable harness. If they are OK, check continuity between PIN 20 of the connector A (BROWN) and PIN 2 of the sensor connector: restore the cable harness if there is not continuity. If there is, it means that the control unit does not supply the ground connection and therefore should be replaced.

- If shorted to negative, check sensor correct resistance: if resistance = 0, replace the sensor; if resistance is correct, it means that the cable has ground connection: restore the cable harness.

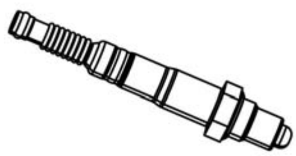
NOTES No error is detected if the sensor does not work correctly or the control unit connector or sensor terminals are rusty: then check through Axone if the temperature indicated is plausible in relation to the ambient temperature. Check also that the sensor electrical characteristics are observed: replace the sensor if not OK; if it is OK, check the sensor connector and the Marelli control unit connector.

Lambda sensor

LAMBDA PROBE

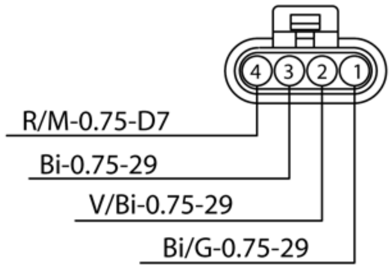
Function

It tells the control unit whether combustion is lean or rich.



Operation / Operating principle

The Marelli injection control unit reads and interprets a voltage generated by the difference in oxygen content between the exhaust fumes and the ambient. It does not require an external supply source but, in order to work properly, it should reach a high operating temperature: that is why there is a heating circuit inside.



Level in wiring diagram: Lambda probe

Location:

- on the vehicle: on the silencer

- connector: near the probe, on the upper metal bracket.

Electrical characteristics:

- Heater circuit: 7-9Ω at Ambient temp.

Pin-out:

1. Sensor signal + (grey wire)
2. Sensor signal - (black wire)
3. Heater ground connection (white)
4. Heater power supply (white)

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AXONE: FUEL INJECTION SYSTEM

PARAMETERS

Lambda probe

Example value: 0 - 1000 mV

Signal when energised that the control unit receives from the lambda probe: inversely proportional to the presence of oxygen.

Lambda integrator

Example value: 0,00 %

In closed loop, the value must be close to 0.00 (values not within the interval from -10.0 % to 10.0 % indicate a fault): for example, value 25% corresponds to +25% with respect to the reference injection time; -25% corresponds to -25%. In an open circuit, the lambda probe signal is too low. Therefore, the control unit takes it as a lean mixture condition and will try to enrich it. The value read will be +25%: once this correction has been tried, the value shifts to 0.00 fixed and the Lambda probe error is signalled.

STATUSES

Lambda

Example value: Open loop / Closed loop

It indicates if the control unit is using (CLOSED) the lambda probe signal to keep the stoichiometric combustion. At idle CLOSED only if: Air T >10° and engine T > 18° and engine running for at least 1-2 minutes.

ELECTRICAL ERRORS

Lambda probe P0130 - shorted to positive / open circuit, shorted to negative.

Error cause

- If shorted to positive, excessive voltage has been detected at PIN 22 of connector B (BLUE). If the circuit is open, shorted to negative, no voltage has been detected. In both cases, the recovery function is hardly noticeable for the customer.

Troubleshooting

- if shorted to positive: with key set to ON, disconnect the sensor connector and measure PIN 1 voltage on the cable harness side (grey cable): if there is voltage (5 or 12 V), restore the cable harness; if there is not, replace the lambda probe.

Lambda probe heater P0130 - shorted to positive / open circuit, shorted to negative.

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 11 of connector B (BLUE). If the circuit is open, shorted to negative: voltage equal to zero has been detected.

Troubleshooting

- If shorted to positive: disconnect the probe connector and check the sensor correct resistance: replace the sensor if not OK; if it is OK, restore the cable harness.
- If the circuit is open, shorted to negative: check the sensor connector: if it is not OK, restore; if it is OK, check the continuity towards the sensor from PINS 3 and 4: if it is not OK, replace the sensor; if it is OK, check the continuity of the white cable between the sensor connector and PIN 11 of connector B (BLUE) of the control unit: if it is not OK, restore the cable harness; if it is OK, it means that the white cable is in continuity with the ground cable and it is necessary to restore the cable harness.

Injector

INJECTOR

Function

To supply the correct amount of petrol at the right

timing.

Operation / Operating principle

Injector coil is excited for the petrol passage to open.

Level in wiring diagram: Coils and injectors

Location:

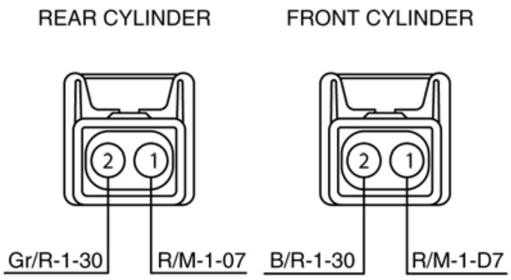
- on the vehicle: on the intake manifolds
- connector: on injector

Electrical characteristics:14.8 Ohm +/- 5% (at 20 °C)

Pin-out:

1. Supply
2. Ground connection





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AXONE:

FUEL INJECTION SYSTEM

PARAMETERS

Injector

Injection time

ELECTRICAL ERRORS

Front injector P0202 - shorted to positive / shorted to negative / open circuit.

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 37 of connector A (BROWN). If shorted to negative: no voltage has been detected. If the circuit is open: an interruption has been detected.

Troubleshooting

- if shorted to positive: disconnect the injector connector, set the key to KEY ON and activate the component with Axone; check if there is voltage at PIN 2 of the injector connector: if there is, restore the cable harness; if there is not, replace the sensor.
- if shorted to negative: disconnect the injector connector, set the key to KEY ON and check if there is a ground connection on PIN 2: if there is, restore; if there is not, replace the injector.
- the circuit is open: check the component correct electrical characteristic: if it is not the correct one, replace the component; if it is correct, check the connector on the component and the Marelli control unit connector: if they are not OK, restore; if they are OK, check the continuity of the cable between PIN 37 of connector A (BROWN) and PIN 2 of the component and restore the cable harness.

Rear injector P0201 - shorted to positive / shorted to negative / open circuit.

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 28 of connector A (BROWN).
- If shorted to negative: no voltage has been detected.
- If the circuit is open: an interruption has been detected.

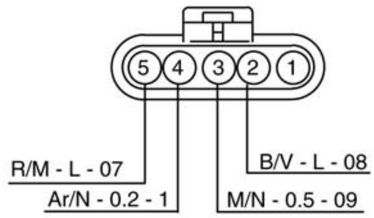
Troubleshooting

- if shorted to positive: disconnect the injector connector, set the key to KEY ON and activate the component with Axone; check if there is voltage at PIN 2 of the injector connector: if there is, restore the cable harness; if there is not, replace the sensor.
- if shorted to negative: disconnect the injector connector, set the key to KEY ON and check if there is a ground connection on PIN 2: if there is, restore; if there is not, replace the injector.
- the circuit is open: check the component correct electrical characteristic: if it is not the correct one, replace the component; if it is correct, check the connector on the component and the Marelli control unit connector: if they are not OK, restore; if they are OK, check the continuity of the cable between PIN 28 of the connector A (BROWN) and PIN 2 of the component and restore the cable harness.

Fuel pump

Electrical characteristics:

- 0.7 +/-0.2 Ohm.



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AXONE: FUEL INJECTION SYSTEM

ACTIVATION

Fuel pump:

Operation for 30 seconds.

ELECTRICAL ERRORS

Fuel pump relay P0230 - shorted to positive / shorted to negative / open circuit.

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 6 of connector B (BLUE).
- If shorted to negative: no voltage has been detected.
- If the circuit is open: an interruption has been detected.

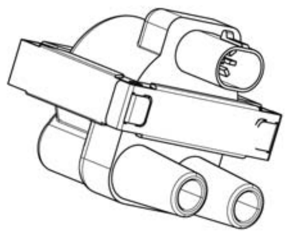
Troubleshooting

- If shorted to positive: disconnect the injection load relay (No. 29 on the wiring diagram) and setting the key to KEY ON, measure the voltage read at PIN 1 of the relay connector towards the cable harness: if voltage is equal to 5 or 12 V, restore the cable harness; if voltage is equal to zero, replace the relay.
- If shorted to negative: disconnect the injection load relay (No. 29 on the wiring diagram) and setting the key to KEY ON (wait for a few seconds), check if there is continuity with

the ground cable to PIN 1 of the relay connector towards the cable harness: if there is continuity, restore the cable harness; if there is not continuity, replace the relay.

- If the circuit is open: check the injection control unit connector and the relay connector: if they are not OK, restore; if they are OK, check the continuity of the grey/blue cable between the two connectors: if there is not continuity, restore the cable harness; if there is continuity, check the continuity of the yellow/grey cable between the relay connector and the auxiliary D fuse: if there is not continuity, restore the cable harness; if there is continuity, check that the relay presents no continuity between PINS 1 and 2, and replace the relay.

Coil



Function

It controls the ignition spark plug in order to generate the fuel ignition spark.

Operation / Operating principle

With inductive discharge: 2 coils with double secondary circuit (Twin spark)

Level in wiring diagram: Coils and injectors

Location:

- Under helmet compartment: Right coil (rear cylinder) and Left coil (front cylinder)

Electrical characteristics:

- Primary circuit resistance: approx. 0.57 Ω at 20°C between PIN 1 and 2
- Secondary circuit resistance: approximately 7.3 Ohm at 20°C

Pin-out:

1. Supply + batt V
2. Activation from control unit



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AXONE: FUEL INJECTION SYSTEM

PARAMETERS

Ignition advance

ACTIVATION

Right coil (rear cylinder):

The auxiliary injection relay (No. 29 in the wiring diagram, placed under helmet compartment, right side) is energised for 5 seconds and the grey/red cable of the coil is closed to ground for 2 ms per second. Disconnect the 4-way connector of the fuel pump to be able to hear the relay and injector activation. The continuity of the wiring is necessary for correct activation: no error indications are displayed in case of lack of activation.

Left coil (front cylinder):

The auxiliary injection relay (No. 29 in the wiring diagram, placed under helmet compartment, right side) is energised for 5 seconds and the orange/green cable of the coil is closed to ground for 2 ms per second. Disconnect the 4-way connector of the fuel pump to be able to hear the relay and injector activation. The continuity of the wiring is necessary for correct activation: no error indications are displayed in case of lack of activation.

ELECTRICAL ERRORS

Right coil (rear cylinder) P0351 - shorted to positive / open circuit, shorted to negative.

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 38 of connector A (BROWN).
- If the circuit is open, shorted to negative: voltage equal to zero has been detected

Troubleshooting

- If shorted to positive: disconnect the coil connector, set the key to ON, activate the coil with Axone and check voltage at connector PIN 1: if there is voltage, restore the cable harness; if voltage = 0, replace the coil
- If the circuit is open, shorted to negative: check the coil connector and the Marelli control unit connector. If they are not OK, restore; if everything is OK, check cable continuity between the two cable terminals. If there is not continuity, restore the cable harness; if there is cable continuity, with key set to KEY ON, check the cable ground insulation (from coil connector or control unit connector). If that is not OK, restore the cable harness.

Left coil (front cylinder) P0352 - shorted to positive / open circuit, shorted to negative

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 10 of connector A (BROWN).
- If the circuit is open, shorted to negative: voltage equal to zero has been detected.

Troubleshooting

- If shorted to positive: disconnect the coil connector, set the key to ON, activate the coil with Axone and check voltage at connector PIN 1: if there is voltage, restore the cable harness; if voltage = 0, replace the coil
- Circuit is open, shorted to negative: check the coil connector and the Marelli control unit connector. If they are not OK, restore; if everything is OK, check cable continuity between the two cable terminals. If there is not continuity, restore the cable harness; if there is cable continuity, with key set to KEY ON, check the cable ground insulation (from coil connector or control unit connector). If this is not OK, restore the cable harness

Throttle body

THROTTLE BODY

- Function

To tell the position of the throttle to the throttle control unit.

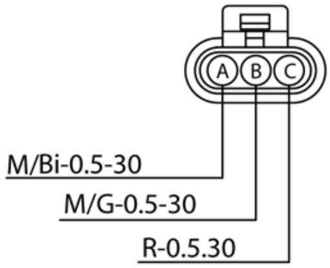
Operation / Operating principle

The throttle position sensor works as a variable resistance according to the throttle rotation.

Level in wiring diagram: Throttle and idle motor

Location:

- on the vehicle: on the intake manifold
- connector: on the throttle body



Electrical characteristics:

- PINS A-C: throttle closed approximately 2.5 kOhm; throttle open approximately 1.5 kOhm.
- PINS A-B: approximately 1.1 kOhm.

Pin-out:

- A - Ground connection
- B - Supply voltage + 5V
- C - Potentiometer signal

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AXONE: FUEL INJECTION SYSTEM

PARAMETERS

Throttle

Example value: 4.9°

STATUSES

Throttle position

Example value: Released/Pressed

It indicates if the throttle potentiometer is open or closed in the released position.

ADJUSTABLE PARAMETERS

Throttle positioner autodetection: It allows the control unit to detect the closed throttle position; just

press the Enter key.

Self-adjustable parameters reset: Lambda probe self-adaptability parameters reset: operation to be carried out after the throttle body is cleaned (every 30,000 km), or in the case a new engine, a new lambda probe or a new injector is fitted, or the correct operation of the injection system or the valves is restored

ELECTRICAL ERRORS

Throttle actuator position sensor P0120

Example value:open circuit, shorted to positive / shorted to negative.

Error cause

- If the circuit is open, shorted to positive: excessive voltage has been detected at PIN 3 of connector A (BROWN).
- If shorted to negative: voltage equal to zero has been detected.

Troubleshooting

- Circuit is open, shorted to positive: check the injection control unit connector and the sensor connector: if they are not OK, restore; if they are OK, check the continuity between PIN 3 of the connector A (BROWN) and PIN C (red cable): if there is not continuity, restore the cable harness; if there is continuity, check continuity of the sensor between PIN A and PIN C: if there is not continuity, replace the throttle body; if there is continuity, check the resistance: if below 1.3 kOhm, replace the sensor; if above 1.3 kOhm, there is a short circuit to positive on the red cable and it is necessary to restore the cable harness.
- If shorted to negative: disconnect the sensor connector and check the ground insulation of the red cable (from throttle sensor connector or control unit connector): if there is continuity with the ground connection, restore the cable harness; if isolated from ground connection, the resistance between PIN A and PIN C is below 1.3 kOhm; therefore, it is necessary to replace the throttle body.

RESET PROCEDURE

Once the throttle body or the injection control unit is replaced, it is necessary to connect to the diagnosis instrument selecting FUEL INJECTION and carry out the operation: Throttle positioner auto-detection.

Engine oil pressure sensor

ENGINE OIL PRESSURE SENSOR

Function:it indicates the instrument panel if there is enough oil pressure (0.5 +/- 0.2 bar) (7.25 +/- 2.91 PSI) in the engine.

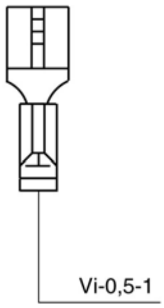
Operation / Operating principle: normally closed switch. With oil pressure above (0.5 +/-0.2 bar) (7.25 +/- 2.91 PSI), open circuit.

Location on the vehicle: under front cylinder

Connector location: on the sensor

Pin-out:

1. Voltage 5V



CAUTION

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Instrument panel

Error DSB 07

Error cause

- An oil sensor failure is signalled when, with engine off, it is detected that the sensor circuit is open. The test is performed only once when the key is set to ON. This error is signalled by the bulb icon and the general warning light turns on as well.

Troubleshooting

- Check the sensor connector and the instrument panel connector (PIN 17): If not OK, restore. If OK, check the continuity of the purple cable between the sensor connector and the instrument panel connector PIN 17: if not OK, restore the cable harness; if OK, replace the sensor.

Error DSB 08

Error cause

- An oil sensor failure is signalled when, with engine running, it is detected that the sensor circuit is closed. This error is signalled by the bulb icon and the general warning light turns on as well.

Troubleshooting

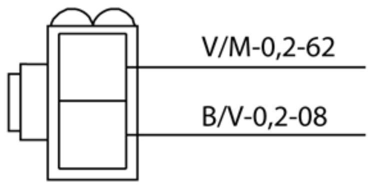
- Check if oil pressure is low with the specific gauge.

Side stand sensor

SIDE STAND SENSOR

Function

It tells the side stand position to the control unit.



Operation / Operating principle

If the gear is engaged and the side stand is unfolded, and therefore the circuit is open, the control unit does not enable vehicle start-up or shuts off the engine if it is rotating.

Level in wiring diagram:start-up enabling switches

Location:

- on the vehicle: on the side stand
- connector: under the fuel tank (inside the rubber protection housing)

Electrical characteristics:

- Side Stand Up: closed circuit (continuity)
- Side Stand Down: open circuit (infinite resistance)

Pin-out:

1. Ground connection
2. Voltage 12V

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AXONE: FUEL INJECTION SYSTEM

STATUSES

Side stand

Example value:up/down

Troubleshooting

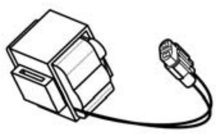
- Indication on Axone always down: check the connector: if not OK, restore; if it is OK, disconnect the two terminals from the sensor and check continuity to ground of PIN 1: if there is no continuity, restore the cable harness; if there is, replace the sensor
- Indication on Axone always up: disconnect the terminals from the sensor and check if there is continuity between the two PINS, with stand down: if there is continuity, replace the sensor; if the circuit is open, it means that on the brown/green cable from sensor PIN 2 to PIN 38 of connector B (BLUE) there is a short circuit to ground: restore the cable harness

Bank angle sensor

FALL SENSOR

Function

it tells the vehicle position to the control unit.



Operation / Operating principle

When the sensor is inverted, the circuit is closed to ground: When the Marelli control unit detects this ground connection, it does not enable start-up or shuts off the engine.

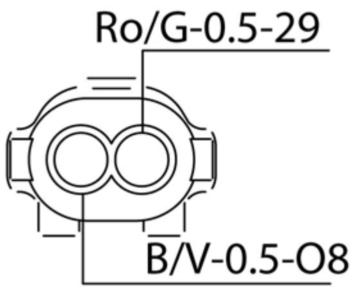
Level in wiring diagram: Start-up enabling switches.

Location:

- on the vehicle: under the saddle, front area near the control unit
- connector: near the sensor

Electrical characteristics:

- Sensor in vertical position: open circuit (resistance: 62 kOhm)
- Sensor inverted: closed circuit (continuity)



Pin-out:

1. Ground connection
2. Voltage 5V

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AXONE: FUEL INJECTION SYSTEM

PARAMETERS

Fall sensor

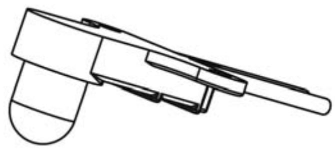
Example value: Normal / Tip over

Troubleshooting

- Indication on Axone always Normal, even when the sensor is inverted: disconnect the connector and, with sensor inverted, check if there is continuity between the two PINS of the sensor: if there is no continuity, replace the sensor; if there is, check the connector. If not OK, restore the cable harness; if OK, check continuity to ground of PIN 2: if there is no continuity, restore the cable harness; if there is, with key set to KEY ON, check if there is 5V voltage at PIN 1. If there is not, check the Marelli control unit connector (PIN 35 of connector B "BLUE")
- Indication on Axone always Tip over: disconnect the connector and check if there is continuity between the two PINS when the sensor is in vertical position: if there is continuity, replace the sensor; if there is not, it means that, with key set to KEY ON, there is no 5V voltage at PIN 1: restore the cable harness whose pink/yellow cable will be shorted to ground

Air temperature sensor - instrument panel

INSTRUMENT PANEL AIR TEMPERATURE SENSOR



Function

It tells the ambient air temperature to the instrument panel.

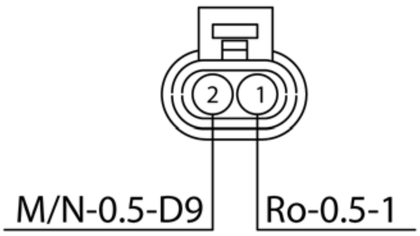
Operation / Operating principle

NTC type sensor (resistance sensor, inversely variable with temperature).

Level in wiring diagram: Temperature sensors

Location:

- on the vehicle: on the plastic protection under the instrument panel
- connector: under the instrument panel



Electrical characteristics:

- Resistance at 0°C: 32.5 kOhm +/- 5%
- Resistance at 25°C: 10.0 kOhm +/- 5%

Pin-out:

1. Voltage 5V
2. Ground connection

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CAUTION

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Instrument panel

ERROR DSB 06

Error cause

- An oil sensor failure is signalled when it is detected that the sensor circuit is open or shorted to positive.

Troubleshooting

- Check the sensor connector and the instrument panel connector (PINS 10 and 30): If not OK, restore; if OK, check the continuity of the pink cable between the sensor connector and the instrument panel connector PIN 10: if not OK, restore the cable harness; if OK, check the correct sensor resistance: if it is not OK, replace the sensor; if it is OK, check the continuity of the brown/black cable between the sensor connector and PIN 30 of the instrument panel connector: If not OK, restore the cable harness; if OK, with key set to ON, check if there is voltage at the sensor connector PIN 1: if there is no voltage, replace the instrument panel; if there is approximately 12V, restore the cable harness (there is a short circuit in the battery). If there is 5V voltage, connect a 10 kOhm resistance to PIN 1 of the sensor connector and to the vehicle ground connection: if, with key set to KEY ON, the voltage measured upstream the resistance decreases, replace the instrument panel. If voltage continues to be approximately 5V, restore the pink cable (there is a short circuit at + 5V).

Notes

If a short circuit to ground is detected at PIN 10 of the instrument panel connector, the display will show a temperature full scale indication.

Check the earth insulation of the sensor connector pink cable: if there is a connection, restore the cable harness; if it is earth insulated, check that sensor resistance is correct: if it is not OK, replace the sensor; if it is OK, replace the instrument panel.

Electric fan circuit

ELECTRIC FAN CIRCUIT

Function

Radiator fan and coolant - Operation.

Operation / Operating principle

When the control unit detects a temperature above 100 °C, it closes the fan control relay pickup circuit to ground until the temperature falls to 97 °C.

Level in wiring diagram:electric fan

Location:

- Relay located under the helmet compartment, right side.

Electrical characteristics:

- relay normally open;
- drive coil resistance 110 Ohm (+/- 10 %)

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AXONE: FUEL INJECTION SYSTEM

ELECTRICAL ERRORS

Fan relay P0481 - shorted to positive / open circuit, shorted to negative.

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 14 of connector B (BLUE). If the circuit is open, shorted to negative: voltage equal to zero has been detected
- If the circuit is open, shorted to negative: voltage equal to zero has been detected.

Troubleshooting

- If shorted to positive: check whether the relay electrical characteristics are correct by disconnecting it from the cable harness. If they are not correct, replace the relay; if they are correct, restore the cable harness (blue/brown cable).
- If the circuit is open/shorted to negative: check whether the relay electrical characteristics are correct by disconnecting it from the cable harness. If they are not correct, replace the relay; if they are correct, restore the cable harness (blue/brown cable).

Electric lock

ELECTRIC LOCK

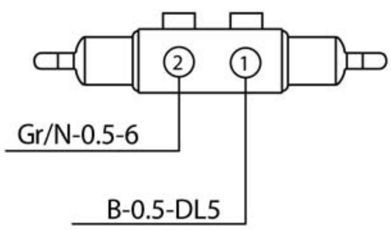
Function

To open the helmet compartment.

Level in wiring diagram: Services.

Location:

- on the vehicle: under key block, left side



- connector: on electric lock

Electrical characteristics:

- 150 Ohm +/- 20 %

Pin-out:

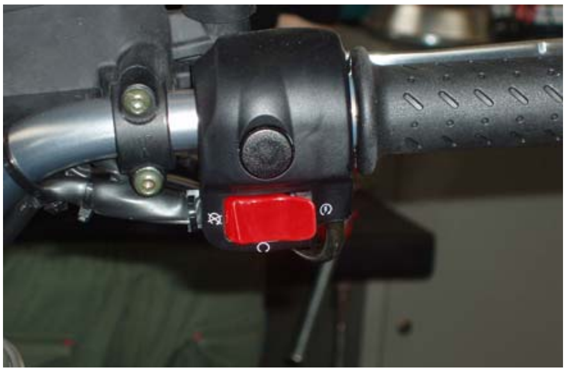
1. Ground.
2. Supply.

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RUN/STOP switch



Run / stop switch

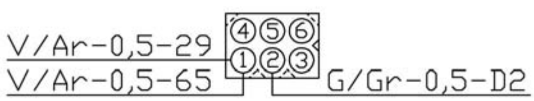
Function

It tells the control unit if the driver wishes to enable engine start-up or to keep the engine running.

Operation / Operating principle

If the driver wants to shut off the engine or to disable engine start-up, the switch should be open, i.e. the Marelli control unit should not detect voltage at PIN 27 of connector B "BLUE".

Level in wiring diagram: Start-up enabling switches.



Location:

- on the vehicle: right light switch
- connector: right side, under helmet compartment, along upper frame.

Electrical characteristics:

- STOP position: the circuit is open
- RUN position: closed circuit
  (continuity)

Pin-out:

1. Green/orange cable: ground connection
2. Yellow/grey cable: voltage 12V

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AXONE: FUEL INJECTION SYSTEM

STATUSES

Run / stop switch

Example value:Run/Stop

Troubleshooting

- Indication on Axone always STOP: disconnect the connector and, with the switch set to RUN, check if there is continuity towards the switch of the two cables- yellow/grey and green/orange: if there is not continuity, replace the sensor; if there is, check the connector. If it is not OK, restore the cable harness; if it is OK, with key set to KEY ON, check if there is voltage on the yellow/grey cable: if there is no voltage, restore the cable harness; if there is, check the yellow/grey cable earth insulation: if there is continuity to ground, restore the cable harness; if it is OK, take the key to KEY OFF and check the control unit connector and the continuity of the yellow/grey cable between the connector in question and PIN 27 of the control unit connector B "BLUE": if not OK, restore the cable harness; if OK, replace the Marelli control unit.
- Indication on Axone always RUN: disconnect the connector and, with the switch set to STOP, check if there is continuity between the two cables of the switch: if there is continuity, replace the switch; if there is not, it means that, with key set to KEY ON, the green/orange cable is shorted to positive: restore the cable harness.

Transmission control unit

GEARSHIFT CONTROL ON HANDLEBAR

Function

It controls the TRANSMISSION system.

Operation / operating principle

It receives information from the sensors connected to it and, via CAN line communication with the instrument panel and the injection control unit, it controls the predetermined operating strategies for the position of the driving pulley in order to obtain the gear ratio requested by the user (manual transmission) or expected according to the kind of calibration of the selected gear (automatic transmission).

Level in wiring diagram: transmission management

Position:

- on the vehicle: between the helmet compartment and the saddle
- connector (if available): on the control unit

Electrical characteristics: -

Pin-out: see the CONNECTORS section

CAUTION

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AXONE / AUTOMATIC TRANSMISSION system

ISO SCREEN PAGE

Hardware number - Example value: 04

Hardware version number - Example value: 0004

Software number - Example value: 04

Software release number - Example value: 0033

NOTES - Control unit mapping

PARAMETERS

Automatic system

Temperature inside the control unit

Example value: °C

There is a sensor inside the control unit.

Maximum value reached by the temperature inside the control unit

Example value: °C

There is a sensor inside the control unit.

ERRORS

EEPROM error - Code 9009 - transmission reset not carried out/ EEPROM access error

Error cause

- If the transmission has not been reset: the potentiometer reset or belt reset procedures have not been successful or a new transmission ECU has been fitted without resetting the transmission. If there is an EEPROM access error: the control unit cannot read or update the data contained in the EEPROM. The transmission ECU should be replaced.

Troubleshooting

- If the transmission has not been reset: the potentiometer reset or belt reset procedures have not been successful, it is therefore necessary to try those operations again by means of the diagnosis instrument, or a new transmission ECU has been fitted without resetting the transmission. In case there is a yellow or black label OBD module, without 2006 legend, it is consider normal that the error is displayed before the Potentiometer reset function, Phase 1, or the Belt replacement, Phase 2: it will no longer be displayed even after this second phase has been carried out correctly.
- If there is an EEPROM access error: replace the transmission ECU (see New control unit activation procedure) and the belt.

Belt wear - Code 9011 - above maximum threshold

Error cause

- Excessively worn belt: the second wear limit has also been exceeded. This implies the forced setting of the transmission in automatic mode, RAIN setting.

Troubleshooting

- It is necessary to replace the worn belt and in the future, before starting the engine, select the Belt replacement or Belt replacement, Phase 1, and Belt replacement, Phase 2, function (next, see Adjustable parameters).

ADJUSTABLE PARAMETERS

Potentiometer reset: Follow the procedure step by step as indicated in the various screen pages (OBD 2006 module).

Belt replacement: Follow the procedure step by step as indicated in the various screen pages (OBD 2006 module).

Potentiometer reset, Phase 1: Follow the procedure step by step as indicated in the various screen pages (yellow or black label OBD module without 2006 legend).

Potentiometer reset, Phase 2: Follow the procedure step by step as indicated in the various screen

pages (yellow or black label OBD module without 2006 legend).

Belt replacement, Phase 1: Follow the procedure step by step as indicated in the various screen pages (yellow or black label OBD module without 2006 legend).

Belt replacement, Phase 2: Follow the procedure step by step as indicated in the various screen pages (yellow or black label OBD module without 2006 legend).

NEW CONTROL UNIT ACTIVATION PROCEDURE

It is necessary to replace also the belt and before the start-up, it is necessary to carry out the Potentiometer reset procedure (driving pulley).

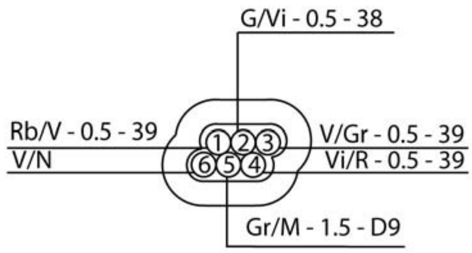
CAUTION

FAILURE TO REPLACE THE BELT CAN SERIOUSLY DAMAGE THE SYSTEM SINCE THE NEW CONTROL UNIT, TAKING FOR GRANTED THE BELT IS NEW, COULD MISJUDGE THE ACTUAL WEAR AND CAUSE THE BELT TO BREAK.

Driving pulley position sensor

Function

It tells the position of the driving half-pulley to the transmission ECU.



Operation / Operating principle

It is a double track potentiometer, with inversely proportional voltage variation.

Level in wiring diagram:transmission management

Location:

- on the vehicle: on the upper part of the transmission cover.
- connector: directly on the sensor.

Electrical characteristics:

- Track resistance (pin 1-5 or 2-3): 1.5 kΩ.
- Signal resistance (pin 4-5 or 3-6): Min 1.0 kΩ (released sensor) - Max. 2.5 kΩ (rotated sensor)

Pin-out:

1. Track 1 ground (Green/Grey - Digitek Pin

A5)

2. Track 2 supply + 5 V (Yellow/Purple - Digitek Pin A4)
3. Track 2 ground (Pink/Purple - Digitek Pin C7)
4. Track 1 signal (Purple/Red to Digitek Pin A2)
5. Track 1 supply + 5 V (Grey/Purple to Digitek Pin C6)
6. Track 2 signal (Green/Pink to Digitek Pin C2)

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AXONE: AUTOMATIC TRANSMISSION system

PARAMETERS

Driving pulley position potentiometer: track 1

Example value:2.02 mm

Current gap, compared to the lower mechanical stop position, based on the potentiometer track 1: to make sure that the read value is correct, check the status of the driving pulley position Potentiometer: track 1.

Driving pulley position potentiometer: track 1

Example value:3.5 V

Current voltage for potentiometer, track 1.

Driving pulley position potentiometer:track 2

Example value:2.09 mm

Current gap, compared to the lower mechanical stop position, based on the potentiometer track 2: to make sure that the read value is correct, check the status of the driving pulley position Potentiometer: track 2.

Driving pulley position potentiometer:track 2

Example value:1.6 V

Current voltage for potentiometer, track 2.

Driving pulley potentiometer supply voltage: track 1

Example value:4.98 V

Voltage supplied by the transmission ECU.

Driving pulley potentiometer supply voltage: track 2

Example value:4.97 V

Voltage supplied by the transmission ECU.

Driving pulley target position

Example value:2.09 mm

Target gap, compared to the lower mechanical stop position, supplied by the control unit based on conveyed commands.

Driving pulley lower stop position

Example value:0 mm

It is the reference position for all the other positions indicated by the driving pulley position sensor.

Driving pulley saved position in first gear

Example value:2.06 mm

It should be a value between 0.5 and 2.5 mm.

Movement of the first gear in relation to the saved position (wear)

Example value:0.03 mm

Even if the belt is worn, the first gear position is modified in relation to the initial position in order to keep the pre-set ratio

AXONE: AUTOMATIC TRANSMISSION system

STATUSES

Driving pulley position potentiometer:track 1

Example value: Invalid data / Valid data

If the "Invalid Data" message is displayed, it means that the parameter value in the Engineering parameters screen page is not correct.

Driving pulley position potentiometer:track 2

Example value: Invalid data / Valid data

If the "Invalid Data" message is displayed, it means that the parameter value in the Engineering parameters screen page is not correct.

NOTE When troubleshooting, use the interface, code 020481Y, with the adaptor, code 020481Y004. The correspondence between the control unit PIN and the interface PIN is the following: control unit PIN A1….A8 and interface PIN interface 11….18, control unit PIN B1….B8 and interface PIN interface 21….28, control unit PIN C1….C8 and interface PIN interface 31….38

ERRORS

Track 1 potentiometer - Code 9001 - above maximum threshold/ below minimum threshold/ signal not valid.

Error cause

- If above the maximum threshold: excessive voltage has been detected at PIN A2. If below the minimum threshold: voltage equal to zero has been detected at PIN A2. If signal is not valid: excessive deviation of the potentiometer track value in relation to the other track.

Troubleshooting

- If over the maximum threshold: with key set to KEY ON, disconnect the sensor and observe, with the diagnosis instrument, if the voltage value of the "Driving pulley position potentiometer: track 1" parameter drops to zero: if it drops to zero, replace the sensor; if it does not, restore the purple/red cable.
- If below the minimum threshold: check the transmission ECU connector and the sensor connector: if they are not OK, restore; if they are OK, check continuity on the purple/red cable: if it is not OK, restore the cable; if it is OK, replace the sensor.
- If signal is not valid: check the transmission ECU connector and the sensor connector: if they are not OK, restore; if they are OK, replace the sensor.

Track 2 potentiometer - Code 9002 - above maximum threshold/ below minimum threshold/ signal not valid.

Error cause

- If above the maximum threshold: excessive voltage has been detected at PIN C2. If below the minimum threshold: voltage equal to zero has been detected at PIN C2. If signal is not valid: excessive deviation of the potentiometer track value in relation to the other track.

Troubleshooting

- If above the maximum threshold: with key set to KEY ON, disconnect the sensor and observe, with the diagnosis instrument, if the voltage value of the "Driving pulley position po-

tentiometer: track 2" parameters drops to zero: if it drops to zero, replace the sensor; if it does not, restore the green/pink cable.

- If below the minimum threshold: check the transmission ECU connector and the sensor connector: if it they are not OK, restore; if they are OK, check continuity on green/pink cable: if it is not OK, restore the cable; if it is OK, replace the sensor.
- If signal is not valid: check the transmission ECU connector and the sensor connector: if they are not OK, restore; if they are OK, replace the sensor.

Driving pulley potentiometer supply voltage: track 1 - Code 900B - signal not valid.

Error cause

- Voltage value at PIN C6 is not within the expected limits.

Troubleshooting

- With key set to KEY ON, read the value of the "Driving pulley potentiometer supply voltage: track 1" parameter: if it is equal to the battery voltage, there is a short circuit on the battery and it is necessary to restore the cable harness; if it is equal to zero, disconnect the sensor: if voltage goes up to approximately 5 V, replace the sensor; if the voltage remains at zero, check the transmission ECU connector: if it is not OK, restore; if it is OK, check if there is continuity between PIN C6 and the ground connection: if there is continuity restore the cable harness; if there is not continuity, replace the transmission ECU.

Driving pulley potentiometer supply voltage: track 2 - Code 900C - signal not valid.

Error cause

- Voltage value at PIN A4 is not within the expected limits.

Troubleshooting

- With key set to KEY ON, read the value of the "Driving pulley potentiometer supply voltage: track 2" parameter: if it is equal to the battery voltage, there is a short circuit on the battery and it is necessary to restore the cable harness; if it is equal to zero, disconnect the sensor: if voltage goes up to approximately 5 V, replace the sensor; if the voltage remains at zero, check the transmission ECU connector: if it is not OK, restore; if it is OK, check if there is continuity between PIN A4 and the ground connection: if there is continuity restore the cable harness; if there is not continuity, replace the transmission ECU.

ADJUSTABLE PARAMETERS

Potentiometer reset

Follow the procedure step by step as indicated in the various screen pages (black label module OBD, 2006).

Potentiometer reset, Phase 1

Follow the procedure step by step as indicated in the various screen pages (yellow or black label OBD module without 2006 legend).

Potentiometer reset, Phase 2

Follow the procedure step by step as indicated in the various screen pages (yellow or black label OBD module without 2006 legend).

FITTING

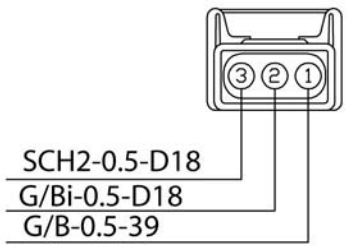
Reset procedure

To be activated in case the variator unit is removed, or the potentiometer is replaced or removed

Driven pulley speed sensor

Function

To indicate the driven pulley speed by reading the speed of rotation of the fixed half-pulley that has four studs.



Operation / Operating principle

Inductive sensor: sinusoidal alternating current is generated (approximately 0.7 V at idle speed) for the transmission ECU reading.

Level in wiring diagram:transmission management

Location:

- on the vehicle: on the crankcase cover, driven pulley upper part.
- under fuel tank (inside the protection rubber housing).

Electrical characteristics: Coil resistance at Ambient temperature: 0.7 - 1.1 kOhm.

Pin-out:

1. Signal (Yellow/Blue)
2. Ground lead (Yellow/White)
3. Shielding

CAUTION

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AXONE: AUTOMATIC TRANSMISSION system

PARAMETERS

Driven pulley rotation

Example value: rpm

To make sure that the read value is correct, check its status in the Device Status screen page.

STATUSES

Driven pulley rotation

Example values: Invalid data / Valid data

If the "Invalid Data" message is displayed, it means that the parameter value in the Engineering parameters screen page is not correct.

ERRORS

Driven pulley rotation sensor Code 9004 - no signal/ signal not valid/ below minimum threshold.

Error cause

- If there is no signal: an electric circuit interruption has been detected at PINS B3 and B6. If signal is not valid: variable signal with excess speed or non variable if below minimum threshold: voltage equal to zero has been detected at PIN B3.

Troubleshooting

- If there is no signal: check the transmission ECU connector and the sensor connector: if it is not OK, restore; if it is OK, check the continuity of the yellow/blue cable between the transmission ECU connector and the sensor connector: if it is not OK, restore; if it is OK, check the continuity of the sensor circuit (PINS 1 and 2 of sensor connector): if it is not OK, replace the sensor; if it is OK, check the continuity between PIN 2 of the sensor con-

nector and PIN B6 of the transmission ECU connector: if it is not OK, restore the cable harness; if it is OK, check with key set to key ON, that PIN B6 of the transmission ECU does not have continuity with the ground connection, and then replace the transmission ECU (in this case the Vehicle speed sensor error (Code 9003), no signal, should also be present).

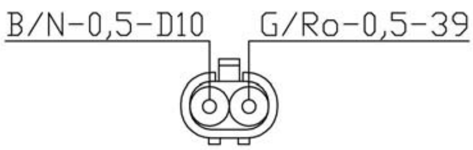
- If signal is not valid: check the sensor resistance, from the transmission ECU connector, between PINS B6 and B6: if it is not OK, replace the sensor; if it is OK, with key set to key ON, check the voltage at PIN B3: if voltage is other than zero, see Phase 1; if voltage is equal to zero, check in the same way with running engine: if the non variable voltage is above zero, replace the sensor; if alternating voltage is excessively below approximately 0.7 V at idle speed, check the correct position of the sensor. Phase 1: check if upon disconnecting the sensor, the PIN B3 voltage reaches zero: if it reaches zero, replace the sensor; if it does not reach zero, restore the cable harness (yellow/blue cable shorted to battery or a cable at 5V).
- If below the minimum threshold: check if there is continuity between PIN B3 and the ground connection: if there is continuity, check if upon disconnecting the sensor, the continuity with the ground connection of PIN B3 is interrupted: if it is interrupted, replace the sensor; if the continuity with the ground connection remains, restore the cable harness (yellow/blue cable shorted to ground connection).

Transmission mode control

GEAR MODE CONTROL

Function

To tell the transmission ECU that the driver wishes to change the gear mode (automatic/manual) and the type of transmission calibration (touring/ sports/ rain).



Operation / operating principle

The circuit is made up of a switch that, when activated, modifies the circuit resistance and consequently the voltage detected.

Level in wiring diagram: transmission management

Position:

- gear mode control on vehicle: right light switch
- connector: right side, under helmet compartment, along upper frame

Electrical characteristics

Released switch 860 +/- 5% Ohm

Pressed switch 180 +/- 5% Ohm

Pin-out:

1. power supply + 5 V
2. ground connection

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AXONE / AUTOMATIC TRANSMISSION system

PARAMETERS

Gear mode control

Example value: 3.8 V

Voltage detected at PIN B7: if the button is pressed, voltage drops from approximately 3-4 V to approximately 1 V.

STATUSES

Gear mode control

Example value: Released/Pressed/Invalid data

If the "Invalid Data" message is displayed, it means that a malfunction has been detected

NOTE: When troubleshooting, use the interface, code 020481Y, with the adaptor, code 020481Y004. The correspondence between the control unit PIN and the interface PIN is the following: control unit PIN A1….A8 and interface PIN interface 11….18, control unit PIN B1….B8 and interface PIN interface 21….28, control unit PIN C1….C8 and interface PIN interface 31….38

ERRORS

Gear mode switch - Code 9005 - above maximum threshold/ below minimum threshold.

Error cause

- If above the maximum threshold: excessive voltage has been detected at PIN B7. If below the minimum threshold: voltage equal to zero has been detected at PIN B7.

Troubleshooting

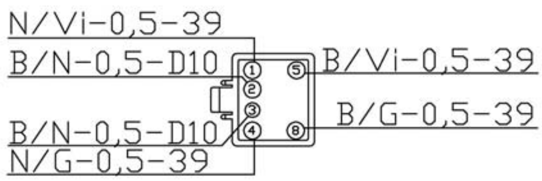
- If above the maximum threshold: check circuit continuity between PIN B7 and C5: if it is not OK, see Phase 1; if it is OK, check the transmission ECU connector and the gear mode control connector and restore. Phase 1: check the continuity of the yellow/pink cable; if it is not OK, restore; if it is OK, check for the interruption in the circuit of the gear mode control and replace the component.
- If below the minimum threshold: check the gear mode control resistance on its connector: if the resistance is not within the expected limit values, replace the control; if it is within the expected values, check the continuity of the yellow/pink cable and the ground connection and then restore the cable harness.

Gearshift pedal

PEDAL GEARSHIFT CONTROL

Function

To tell the transmission ECU that the driver wishes to change the variator transmission ratio (gear shift in manual gear mode).



Operation / operating principle

Either control (+) or (-) is made up of a deviator with both outputs electrically connected to the transmission ECU.

Level in wiring diagram: transmission management

Position:

- pedal gearshift control on vehicle: pedal gearshift lever
- connector: under the fuel tank (inside the rubber protection housing)

Electrical characteristics

Gear upshift:

- 0 Ohm, between PIN C5 and PIN A7,
- infinite resistance between PIN C5 and PIN A3

Gear downshift:

- 0 Ohm between PIN C5 and PIN A6
- infinite resistance between PIN C5 and PIN C4

Pin-out:

Gear upshift:

- 1 - supply + 12 V (blue - black/purple)
- 2 - ground (brown - blue/black)
- 5 - supply + 12 V (red - blue/purple)

Gear downshift:

- 3 - ground (black - blue/black)
- 4 - supply + 12 V (green - black/yellow)
- 8 - supply + 12 V (yellow - blue/yellow)

THE CONNECTION DIAGRAMS ARE IN THE ELECTRICAL SYSTEM SECTIONS; PAY ATTENTION TO THESE DIAGRAMS AS THEY SHOW THE CONNECTOR/COMPONENT AS VIEWED FROM THE CABLE HARNESS SIDE, THAT IS LOOKING AT THE CABLES WHEN GOING OUT OF THE "MAIN" CABLE HARNESS AND INTO THE CONNECTOR/COMPONENT.

CAUTION

BEFORE CARRYING OUT ANY TROUBLESHOOTING, CAREFULLY READ THE GENERAL CONCEPTS OF ELECTRICAL TROUBLESHOOTING FOUND AT THE BEGINNING OF THE CHECKS AND CONTROLS SECTION IN THE ELECTRICAL SYSTEM CHAPTER.

AXONE / AUTOMATIC TRANSMISSION system

STATUSES

Pedal gear upshift control

Example value: Released/Pressed/Invalid data

If the "Invalid Data" message is displayed, it means that a malfunction has been detected

Pedal gear downshift control

Example value: Released/Pressed/Invalid data

If the "Invalid Data" message is displayed, it means that a malfunction has been detected

NOTE: When troubleshooting, use the interface, code 020481Y, with the adaptor, code 020481Y004. The correspondence between the control unit PIN and the interface PIN is the following: control unit PIN A1….A8 and interface PIN interface 11….18, control unit PIN B1….B8 and interface PIN interface 21….28, control unit PIN C1….C8 and interface PIN interface 31….38.

ERRORS

Pedal gear upshift control - Code 900D - signal not valid for logic reasons/ blocked control.

Error cause

- If the electric signal is not valid due to a logic reason: the control unit detects no voltage or the same voltage as the other at PIN A3 or PIN A7. If the control is blocked: the control has been in the pressed position for too long (some minutes).

Troubleshooting

- If the electric signal is not valid due to a logic reason: the transmission ECU waits to detect a voltage above approximately 1V in one of the two PINS and at the same time, a voltage below approximately 1 V in the other PIN; if this does not happen, the control unit signals this error. CASE 1) If voltage is below 1V on both, with control not activated, it means that a voltage below 1V, instead of battery, is detected at PIN A3; disconnect the gearshift control connector and read voltage at PIN A3: if voltage is below 1 V, it means that on the blue/yellow cable there is a short circuit to ground; if voltage is above 1 V (approximately battery voltage), replace the gear upshift control sensor. CASE 2) if both voltages are below 1 V with control activated, it means that at that moment a voltage below 1 V, instead of battery, is detected at PIN A7; disconnect the gearshift control connector and read voltage at PIN A7: if voltage is below 1 V, it means that on the black/yellow cable there is a short circuit to ground; if the voltage is above 1 V (approximately battery voltage), replace the gear upshift control sensor CASE 3) if both voltages are the same as the battery voltage, with control not activated, it means that there is an interruption in the circuit from PIN A7 to PIN C5 or that PIN C5 does not have a ground connection: check the transmission ECU connector and the gearshift control connector: if they are not OK, restore; if they are OK, check continuity on the black/yellow cable: if it is not OK, restore; if it is OK, check continuity on the blue/black cable from the gearshift control connector to PIN C5: if it is not OK, restore; if it is OK, check continuity of the gearshift control from the gearshift control connector (between green cable and black cable): if it is not OK, replace the control; if it is OK, check, with key set to KEY ON, that there is no ground connection in the blue/black cable and then replace the transmission ECU. CASE 4) if both voltages are above 1 V (approximately battery voltage), with control activated, it means that there is an interruption on the circuit from PIN A3 to PIN C5: check the trans-

mission ECU connector and the gearshift control connector: if they are not OK, restore; if they are OK, check continuity on the blue/yellow cable: if it is not OK, restore; if it is OK, check, with control activated, that there is not continuity of the gearshift control from the gearshift control connector (between black cable and yellow cable) and then replace the control.

- If the control is blocked: check the control mechanically: if it is not OK, restore; if it is OK, it means that the "Pedal gear upshift control" statues on the diagnosis instrument indicates "Pressed": the gear upshift control must be replaced.

Pedal gear downshift control - Code 900E - signal not valid for logic reasons/ blocked control.

Error cause

- If the electric signal is not valid due to a logic reason: the control unit detects no voltage or the same voltage as the other at PIN C4 or PIN A6. If the control is blocked: the control has been in the pressed position for too long.

Troubleshooting

- If the electric signal is not valid due to a logic reason: CASE 1) if both voltages are below 1 V, with control not activated, it means that a voltage below 1 V, instead of battery, is detected at PIN C4; disconnect the gearshift control connector and read voltage at PIN C4: if voltage is equal to 1 V or below, it means that on the blue/purple cable there is a short circuit to ground; if voltage is above 1 V, replace the gear upshift control sensor. CASE 2) if both voltages are below 1 V with control activated, it means that at that moment a voltage below 1 V, instead of battery, is detected at PIN A6; disconnect the gearshift control connector and read voltage at PIN A6: if voltage is below 1 V, it means that on the black/purple cable there is a short circuit to ground; if the voltage is above 1 V (approximately battery voltage), replace the gear upshift control sensor. CASE 3) if both voltages are above 1 V (approximately battery voltage), with control not activated, it means that there is an interruption in the circuit from PIN A6 to PIN C5 or that PIN C5 does not have a ground connection: check the transmission ECU connector and the gearshift control connector: if they are not OK, restore; if they are OK, check continuity on the black/purple cable: if it is not OK, restore; if it is OK, check continuity on the blue/black cable from the gearshift control connector to PIN C5: if it is not OK, restore; if it is OK, check continuity of the gearshift control from the gearshift control connector (between red cable and blue cable): if it is not OK, replace the control; if it is OK, check, with key set to KEY ON, that there is no ground connection in the blue/black cable and then replace the transmission ECU. CASE 4) if both voltages are above 1 V (approximately battery voltage), with control

activated, it means that there is an interruption on the circuit from PIN C4 to PIN C5: check the transmission ECU connector and the gearshift control connector: if they are not OK, restore; if they are OK, check continuity on the blue/purple cable: if it is not OK, restore; if it is OK, check, with control activated, that there is not continuity on the gearshift control from the gearshift control connector (between red cable and brown cable) and then replace the control.

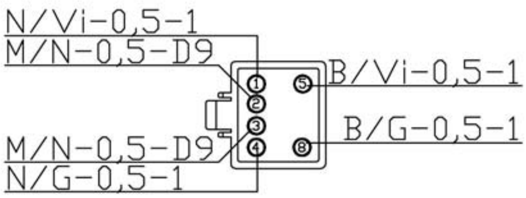
- If the control is blocked: check the control mechanically: if it is not OK, restore; if it is OK, it means that on the diagnosis instrument the status of "Pedal gear downshift control" indicates "Pressed": the gear downshift control must be replaced.

Gearshift lever on the handlebar

GEARSHIFT CONTROL ON HANDLEBAR

Function

To tell the transmission ECU that the driver wishes to change the variator transmission ratio (if transmission in manual mode).



Operation / operating principle

Either control (+) or (-) is made up of a deviator with both outputs electrically connected to the instrument panel: at the same time, the instrument panel sends the requested command to the transmission ECU, via CAN line.

Level in wiring diagram: -

Position:

- handlebar gearshift control on vehicle: left light switch
- connector: behind front headlight, under the instrument panel

Electrical characteristics

Gear upshift:

- 0 Ohm, between PIN 2 and PIN 1
- infinite resistance between PIN 2 and PIN 5

Gear downshift:

- 0 Ohm between PIN 3 and PIN 8
- infinite resistance between PIN 3 and PIN 4

Pin-out:

Gear upshift:

- 1 - supply + 12 V (green - black/ purple)
- 2 - ground (black - brown/black)
- 5 - supply + 12 V (yellow - blue/purple)

Gear downshift:

- 3 - ground (brown - brown/black)
- 4 - supply + 12 V (blue - black/yellow)
- 8 - supply + 12 V (red - blue/yellow)

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AXONE / AUTOMATIC TRANSMISSION system

STATUSES

Handlebar gear upshift control

Example value: Released/Pressed/Invalid data

If the "Invalid Data" message is displayed, it means that a malfunction has been detected.

Handlebar gear downshift control

Example value: Released/Pressed/Invalid data

If the "Invalid Data" message is displayed, it means that a malfunction has been detected.

ERRORS

Handlebar gear upshift control - Code 900F - signal not valid

<u>Error cause</u>

- There is a malfunction in the handlebar gear upshift control.

Troubleshooting

- If, besides the error, the status of "Handlebar gear upshift control" indicates "Invalid data": the instrument panel waits to detect a voltage above approximately 1 V at one of either PINS and at the same time a voltage below approximately 1 V on the other PIN; if this does not happen, the instrument panel sends the information to the control unit which signals this error. CASE 1) if the voltage is below 1V on both, with control not activated, it means that a voltage below 1V, instead of battery, is detected at instrument panel PIN 5; disconnect the gearshift control connector and read voltage at PIN 5 of the instrument panel: if voltage is below 1 V, it means that on the blue/purple cable there is a short circuit to ground; if voltage is above 1 V (approximately battery voltage), replace the gear upshift control sensor. CASE 2) if both voltages are below 1 V with control activated, it means that at that moment a voltage below 1 V, instead of battery, is detected at PIN 13 of the instrument panel; disconnect the gearshift control connector and read voltage at PIN 13 of the instrument panel: if voltage is below 1 V, it means that on the black/purple cable there is a short circuit to ground; if the voltage is above 1 V (approximately battery voltage), replace the gear upshift control sensor. CASE 3) if both voltages are equal to battery voltage, with control not activated, it means that there is an interruption in the circuit from PIN 13 to PIN 30 of the instrument panel or that PIN 30 does not have a ground connection: check the instrument panel connector and the gearshift control connector: if they are not OK, restore; if they are OK, check continuity on the black/purple cable: if it is not OK, restore; if it is OK, check continuity on the brown/black cable from gearshift control connector to PIN 30 of the instrument panel: if it is not OK, restore; if it is OK, check continuity of the gearshift control from the gearshift control connector (between black cable and green cable): if it is not OK, replace the control; if it is OK, check, with key set to key ON, that there is no ground connection in the brown/black cable and then replace the instrument panel. CASE 4) if both voltages are above 1 V (approximately battery voltage), with control activated, it means that there is an interruption on the circuit from PIN 5 to PIN 30 of the instrument panel: check the instrument panel connector and the gearshift control connector: if they are not OK, restore; if they are OK, check continuity on the blue/purple cable: if it is not OK, restore; if it is OK, check, with control activated, that there is not continuity of the gearshift control from the gearshift control connector (between black cable and yellow cable) and then replace the control.
- If, besides the error, the status of "Handlebar gear upshift control" indicates "Pressed", check the control mechanically: If it is not OK, restore; if it is OK, the gear upshift control must be replaced.

ERRORS

Handlebar gear downshift control - Code 9010 - signal not valid

Error cause

- There is a malfunction in the handlebar gear downshift control.

Troubleshooting

- If, besides the error, the status of "Handlebar gear upshift control" indicates "Invalid data": the instrument panel waits to detect a voltage above approximately 1 V at one of either PINS and at the same time a voltage below approximately 1 V on the other PIN; if this does not happen, the instrument panel sends the information to the control unit which signals this error CASE 1) if the voltage is below 1V on both, with control not activated, it means that a voltage below 1V, instead of battery, is detected at PIN 18 of the instrument panel; disconnect the gearshift control connector and read voltage at PIN 18 of the instrument panel: if voltage is below 1 V, it means that on the blue/yellow cable there is a short circuit to ground; if voltage is above 1 V (approximately battery voltage), replace the gear upshift control sensor. CASE 2) if both voltages are below 1 V with control activated, it means that at that moment a voltage below 1 V, instead of battery, is detected at PIN 19 of the instrument panel; disconnect the gearshift control connector and read voltage at PIN 19 of the instrument panel: if voltage is below 1 V, it means that on the black/yellow cable there is a short circuit to ground; if the voltage is above 1 V (approximately battery voltage), replace the gear upshift control sensor CASE 3) if both voltages are equal to battery voltage, with control not activated, it means that there is an interruption in the circuit from instrument panel PIN 19 to PIN 30 or that PIN 30 does not have a ground connection: check the instrument panel connector and the gearshift control connector: if they are not OK, restore; if they are OK, check continuity on the black/yellow cable: if it is not OK, restore; if it is OK, check continuity on the brown/black cable from gearshift control connector to PIN 30 of the instrument panel: if it is not OK, restore; if it is OK, check continuity of the gearshift control from the gearshift control connector (between brown cable and blue cable): if it is not OK, replace the control; if it is OK, check, with key set to key ON, that there is no ground connection in the brown/black cable and then replace the instrument panel. CASE 4) if both voltages are above 1 V (approximately battery voltage), with control activated, it means that there is an interruption on the circuit from PIN 18 to PIN 30 of the instrument panel: check the instrument panel connector and the gearshift control connector: if they are not OK, restore; if they are OK, check continuity on the blue/yellow cable: if it is not OK, restore; if it is OK, check, with control activated, that there is not continuity on the gearshift control from the gearshift control connector (between brown cable

and red cable) and then replace the control.

- If, besides the error, the status of "Handlebar gear downshift control" indicates "Pressed", check the control mechanically: if it is not OK, restore; if it is OK, the gear downshift control must be replaced.

Driving pulley electric motor

DRIVING PULLEY CONTROL ELECTRICAL MOTOR

Function

By means of a transmission gear, it allows the rotation of the driving pulley control bushing which in turn moves the driving half-pulley axially.

Operation / Operating principle

DC motor with pulse activation (duty cycle). The rotation in both directions is controlled by the control unit by inverting the power supply polarity.

Level in wiring diagram: Transmission management

Location:

- on the vehicle: up and to the left of the transmission cover
- connector: Under helmet compartment

Electrical characteristics:

- Winding resistance < 1 Ohm
- Input: nominal 10A
- Maximum input: 22 A

Pin-out:

1. Red
2. Black

AXONE / AUTOMATIC TRANSMISSION system

PARAMETERS

Driving pulley control electrical motor duty cycle

Example value: %

It is a speed indicator of the driving half-pulley movement in axial direction.

NOTE: When troubleshooting, use the interface, code 020481Y, with the adaptor, code 020481Y004. The correspondence between the control unit PIN and the interface PIN is the following: control unit PIN A1….A8 and interface PIN interface 11….18, control unit PIN B1….B8 and interface PIN interface 21….28, control unit PIN C1….C8 and interface PIN interface 31….38.

ERRORS

Driving pulley electrical motor - Code 900A - excessive actuation time/ excessive current input/ signal not valid.

Error cause

- If activation time is excessive: the position is not reached within a standard time although the driving pulley motion control is activated. If input current is excessive: the transmission ECU detects excessive ampere input for the driving pulley electric motor. If the signal is not valid: a short-circuit to ground has been detected at battery PIN A8 or PIN B8.

Troubleshooting

- If activation time is excessive: check circuit continuity between PIN A8 and B8: if it is not OK, continue with Phase 1; if it is OK, check the gears which receive the movement from the electrical motor and set the position of the driving half-pulley. Phase 1: check continuity of the red cable and the black cable between the electrical motor connector and the control unit connector: if they are not OK, restore the cable harness; if they are OK, check that there is not continuity on the circuit of the electrical motor and replace it.
- If input current is excessive: check the driving half-pulley movement system mechanically (excessive friction material).
- If the signal is not valid: set the key to key ON and check the voltage value at PIN A8 and B8 which should be approximately 3 V at both PINS; if there is voltage similar to battery voltage or there is continuity with the ground in one of the two PINS, restore the cable harness; otherwise, replace the transmission ECU.

Connectors

Can line

CAN line

Function

It allows communication between the Marelli injection control unit, the transmission ECU and the instrument panel.

Level in wiring diagram:CAN line

Pin-out: see wiring diagram

AXONE / AUTOMATIC TRANSMISSION system:

ERRORS

"Mute Node" CAN Line, U1601 - Mute Node.

Error cause

- The transmission ECU cannot send CAN signals; it receives signals from the instrument panel and the injection control unit: the control unit may need replacing.

Troubleshooting

- Replace transmission ECU.

CAN line to instrument panel Code 9007 - no signal

Error cause

- No signal arrives to the instrument panel from either CAN line cables.

Troubleshooting

- Check the connector of the instrument panel: if it is not OK, restore; if it is OK, check the continuity of the two lines from the instrument panel connector to the transmission ECU connector: if not OK, restore the cable harness; if OK, replace the instrument panel.

CAN line to injection ECU Code 9006 - no signal

Error cause

- No signal arrives from the injection ECU from either CAN line cables.

Troubleshooting

- Check the transmission ECU connector and the Marelli control unit connector: if they are not OK, restore; if they are OK, check the continuity of the two lines from the transmission ECU connector and from the Marelli control unit connector: if it is not OK, restore the cable harness; if it is OK, replace the Marelli control unit.

AXONE / FUEL INJECTION system:

ERRORS

Mute Node CAN Line, U1601 - Mute Node

Error cause

- The control unit cannot send CAN signals; it receives signals from the instrument panel and the transmission ECU: the control unit may need replacing.

Troubleshooting

- Replace injection ECU.

CAN line, no signal, U1602- Bus Off

Error cause

- No communication on CAN line (PIN B4 and/or PIN B5): problem on the whole network (for example, battery cut-off or short circuited or shorted to ground).

Troubleshooting

- Check the Marelli control unit connector: if not OK, restore; if OK, check the earth insulation of the two CAN lines from PIN 20 and PIN 51 of the VEHICLE connector: If not OK, restore the cable harness; if OK, check continuity of the two CAN lines from the Marelli control unit VEHICLE connector to the filter casing large connector and to the instrument panel connector: if not OK, restore the cable harness; if OK, check that the two lines are not short circuited to positive testing each of the 3 connectors (Marelli control unit connector, filter casing large connector and instrument panel connector) with 1 connector disconnected at a time and by setting the key to ON: If not OK, restore; if OK, replace the Marelli control unit.

CAN line to instrument panel, U1701 - No signal

Error cause

- No signal arrives to the instrument panel from either CAN line cables.

Troubleshooting

- Check the connector of the instrument panel: if it is not OK, restore; if it is OK, check the continuity of the two lines from the instrument panel connector to the injection ECU connector: if not OK, restore the cable harness; if OK, replace the instrument panel.

CAN line to transmission ECU, U1702 - No signal

Error cause

- No signal arrives from the transmission ECU from either CAN line cables.

Troubleshooting

- Check the transmission ECU connector and the Marelli control unit connector: if they are not OK, restore; if they are OK, check the continuity of the two lines from the transmission ECU connector and from the Marelli control unit connector: if it is not OK, restore the cable harness; if it is OK, replace the transmission ECU.

INDEX OF TOPICS

Vehicle preparation

- Rest the vehicle on its rear centre stand.
- Remove the helmet compartment.
- Remove the radiator.
- Remove the expansion tank.
- Disconnect the lambda probe connector.



- Disconnect the rear stop switch connector.



- Disconnect the fall sensor connector.

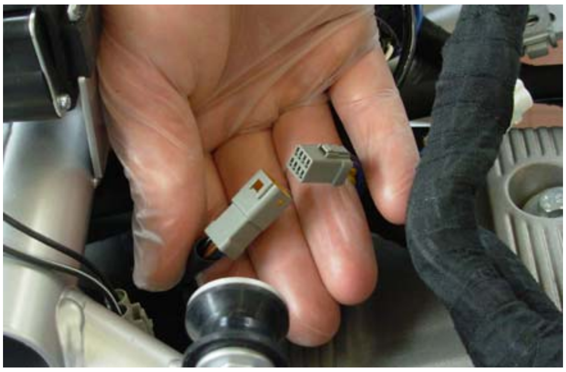


- Disconnect the pickup connector.



- Disconnect the two sensors.

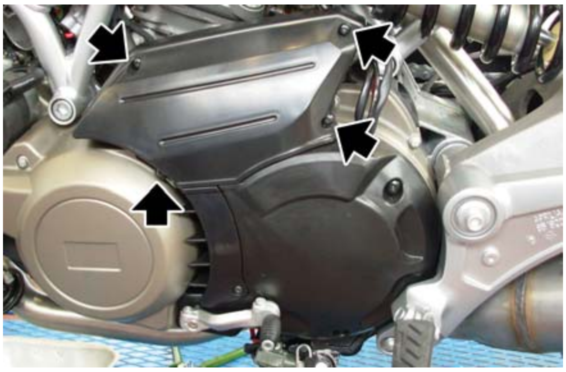




- Remove the clamp.



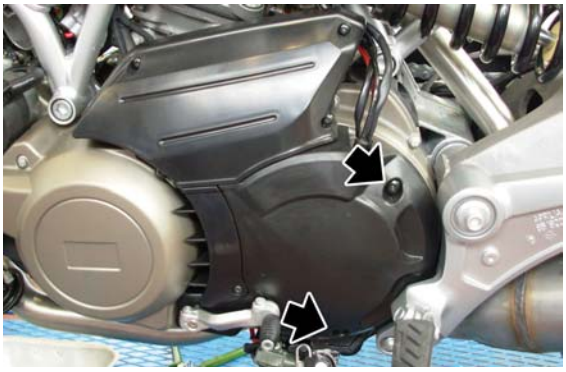
- Undo and remove the four upper fixing screws.



- Remove the upper cover of the transmission cooling housing.



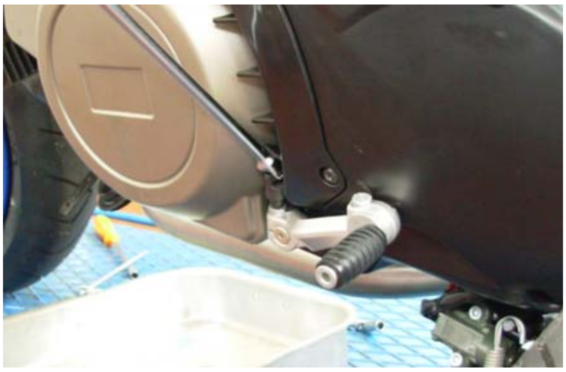
- Undo and remove the two lower fixing screws.



- Undo and remove the internal fixing screw.



- Undo and remove the screw fixing the gearshift lever.
- Remove the gearshift lever.



- Undo and remove the lower screw.



- Remove the left passenger footrest support.

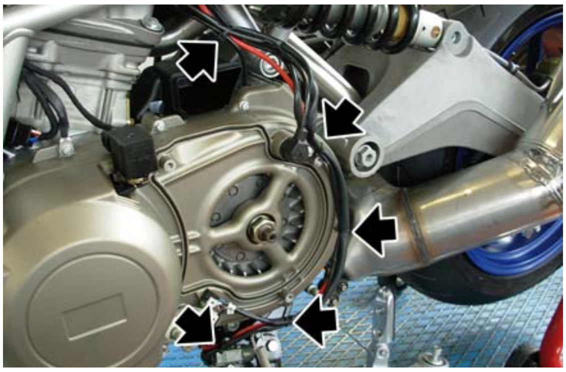
- Remove the transmission cooling cover.



- Undo and remove the starter motor supply cable fixing nut.
- Slide off the starter motor power supply cable.



- Remove the five clamps placed on the cable harness.



- Undo and remove the screw fixing the

speed sensor.

- Remove the speed sensor.



- Undo and remove the two screws fixing the stand sensor.
- Remove the stand sensor.



- Undo and remove the gear sensor fixing screw.
- Remove the two gearshift pedal sensors.



- Disconnect the potentiometer connector.

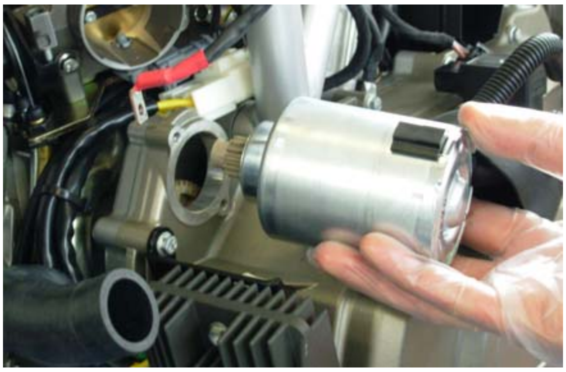




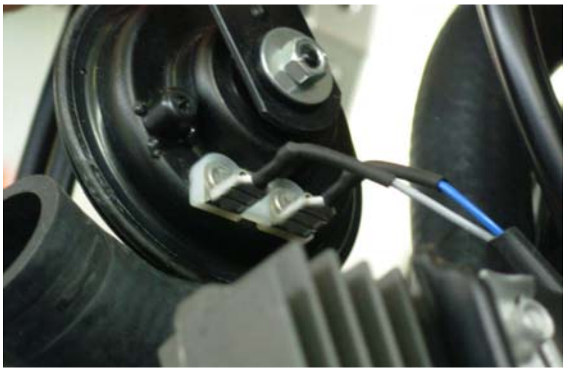
- Remove the variator motor cover.
- Undo and remove the two fixing screws.



- Remove the variator motor.



- Disconnect the horn connectors.



- Disconnect the yellow cable connector.



- Remove the connector of the voltage regulator cable harness.



- Remove the ground lead.



- Disconnect the intake air sensor from the throttle body.



- Disconnect the temperature sensor from the throttle body.



- Remove the two retaining straps.
- Disconnect the timing sensor.



- Working on the left side, slide off the spark plug tube.



- Working on the right side, slide off the spark plug tubes.



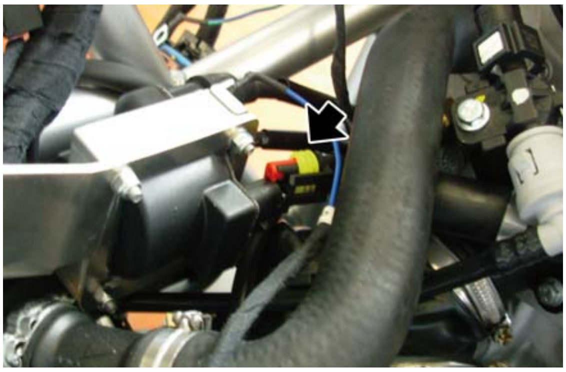
- Disconnect the front coil connector.



- Release the coil ground lead.



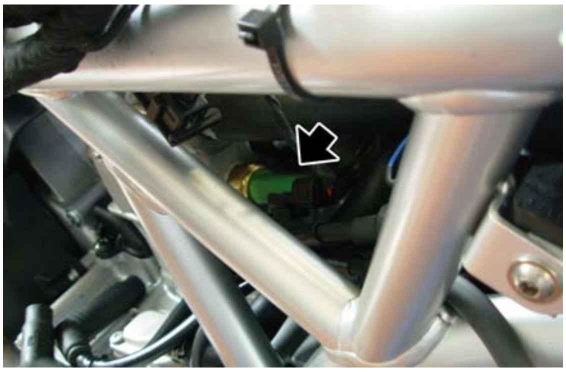
- Disconnect the rear coil connector.



- Slide off the six relays from their seats.



- Release the water bulb.



- Undo and remove the fixing screw and collect the washer.



- Release the two quick-release joints for fuel delivery and return.



- Remove the injector connectors.



- Disconnect the ignition connectors.



- Remove the oil pressure sensor and release it from the seal clamp.



- Remove the exhaust.

- Slide off the rubber protection.
- Undo and remove the cable holder sheath fixing nut.

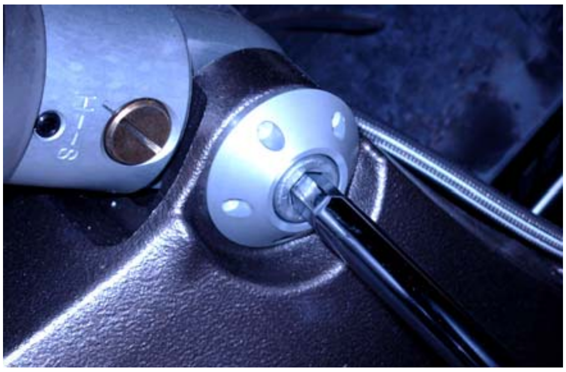


- Slide off the throttle grip cable.
- Repeat the same operations for the second throttle grip cable.



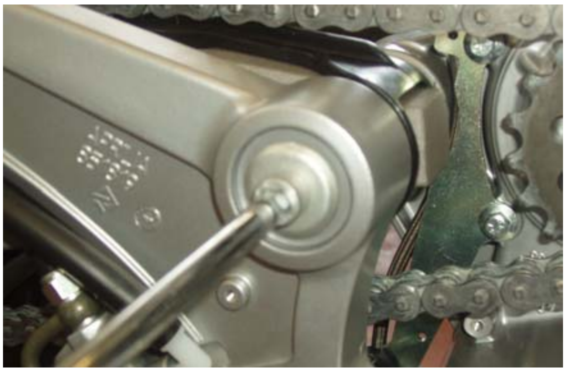
Removing the engine from the vehicle

- Carry out the operations described under Vehicle preparation.
- Support the vehicle by means of belts and a hoist.
- Remove the saddle.
- Remove the passenger grab handle.
- Remove the helmet compartment.
- Remove the radiator.
- Remove the filter casing.
- Remove the transmission cooling cover.
- Remove the left footrest plate.
- Remove the exhaust.
- Position the vehicle adequately on the front service stand and on the under-sump stand.
- Undo and remove the rear shock absorber fixing screw.
- Secure the shock absorber to the chassis.



- Release the parking brake cable.

- Undo and remove the plate fixing screw and remove the right footrest holder plate.



- Unscrew and remove the lower nut.



- Undo and remove both brake plate fixing screws.



- Unscrew and remove the fixing nut.
- Collect the washer.



- Working on the right side, hold the fork and with a rubber hammer, collect the fork pin.



- Slide off the chain from the pinion.

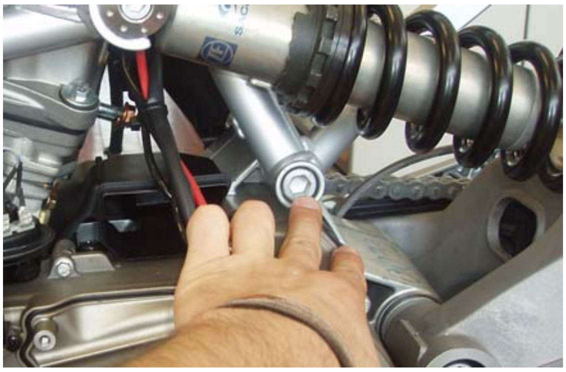
- From behind, slide off the fork unit to-

gether with gear and chain.



- Working on the left side, unscrew and remove the fixing nuts of the engine bolts.





- Working on the right side, slide off the engine bolts.
- Lower the engine.

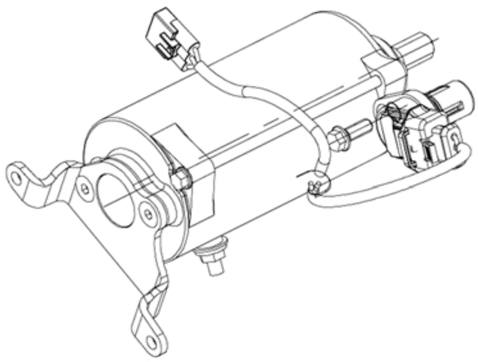




INDEX OF TOPICS

This section describes the operations to be carried out on the engine and the tools required.

Starter motor



The starter motor is sold as a complete part.

Before deciding on its replacement, it is necessary to carry out the following checks:

- Battery

Check the voltage after a pause:

Voltage > 12.5 V

- Check the correct connection of the negative terminals (battery negative and starter motor negative) between them and to the chassis.

- Recharge and if necessary, replace the battery.
- Connect the diagnostic tester (see the «injection» chapter).

Connect the induction clamp of an ammeter to the starter motor power supply positive cable.

Remove the 7.5A fuse No. 10 (see the «fuses» chapter).

Switch «ON» with the switch set in the «RUN» position and the side stand up.

Select the «PARAMETERS» function.

Command to start the engine (so that it cannot move) long enough to measure the rpm and starter motor input.

NOTE

THE DECLARED RPM VALUE IS THAT INDICATED BY THE DIAGNOSTIC TESTER, THE RPM READING IS NOT THE REAL ONE, BUT IT IS VALID FOR DIAGNOSIS PURPOSES.

Specific tooling

020460Y Scooter tester and diagnosis

Electric characteristic

Input at driving speed:

120 A

Engine speed

~300 ÷ 400 rpm

The start-up system has a gear between the motor armature and the crankshaft equipped with a freewheel coaxial to the flywheel and the torque limiter on the intermediate shaft.

The torque limiter is calibrated at 100 Nm (73.76 lbf ft); this component protects the structure of the engine and the start-up kinematic mechanism in the event of incorrect start-up procedure, resulting in inverse rotation.

The freewheel is used for a sufficiently silent start-up.

The start-up control (energised remote control) is slaved to enabling signals by the side stand and the emergency OFF/RUN switch, which does not allow starting given dangerous conditions.

The start-up control circuit is not controlled by the immobiliser system; therefore, before insisting on the starter system in an abnormal way, check the immobiliser enabling switch.

To check the enabling switch circuit, see the "Electrical system" chapter; to check the crankshaft control transmission, follow what is described in the «Flywheel and start-up system» chapter.

Removing the starter motor

- Disconnect the electric terminals.
- Unscrew the nuts fixing it to the crankcase.



Installing the starter motor

- Check that the O-ring is in good conditions and lubricate it.
- Fit the starter motor.
- Tighten the 2 fixing screws to the prescribed torque.

Locking torques (N*m)

Starter motor retainers 11 Nm - 13 Nm (8.11 lbf ft - 9.59 lbf ft



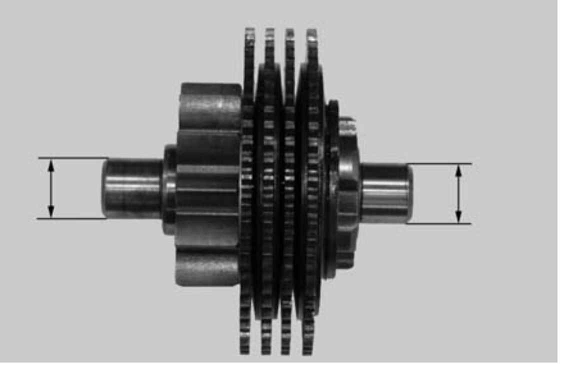
Removing the idle gear

- Check that the toothing is not worn.
- Check the diameter of the two bearings.

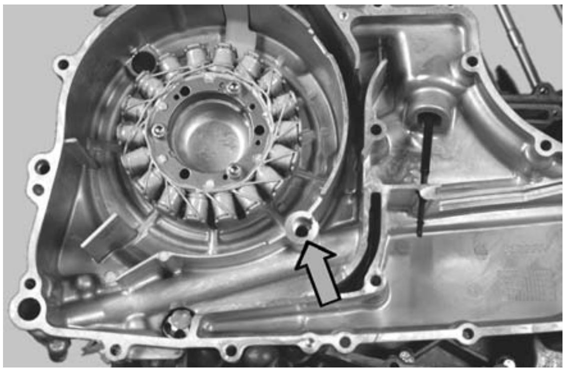
Characteristic

Gear bearing diameter

12 (0; - 0.011) mm (0.47000 (0; -0.00043) in)



Also check the diameter of the bearings on the flywheel cover and on the engine crankcase.



Characteristic

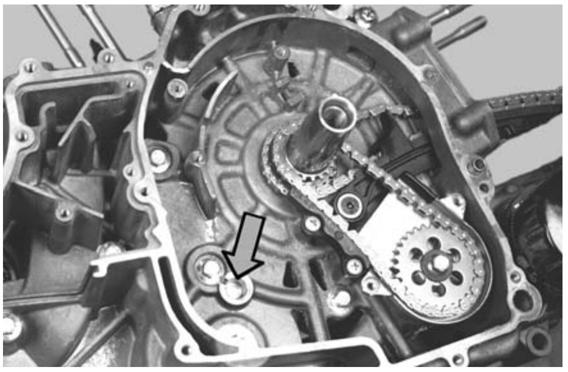
Diameter of bearing on the flywheel cover

12 (+0.034; - 0.016) mm (0.47000 (+0.0013; - 0.0006) in)

Characteristic

Diameter of bearing on the engine crankcase

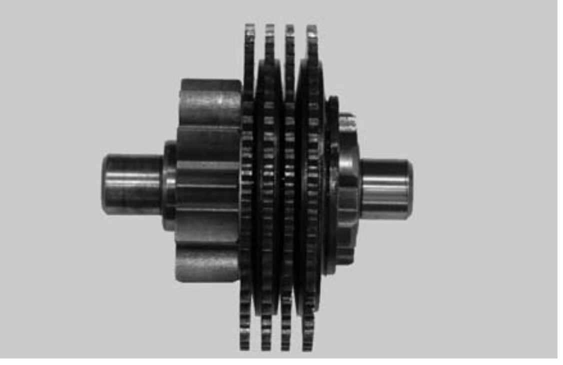
12 (+0.034; - 0.016) mm (0.47000 (+0.0013; - 0.0006) in)



NOTE

THE TORQUE LIMITER IS EQUIPPED WITH 4 GEARS THAT FUNCTION AS CLUTCH DRIVING PLATES.

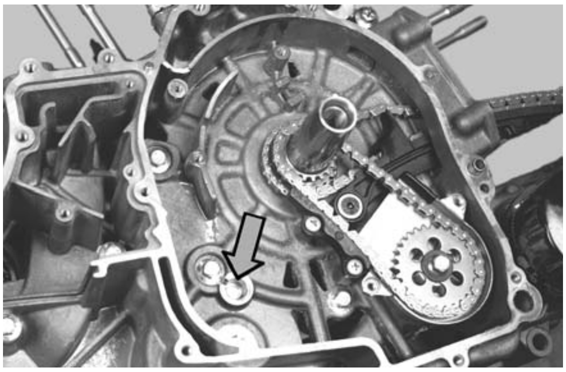
Driven plates consist of 4 Belleville springs with grooved profiles; this assembly allows transmitting torques below 100 Nm (73.75 lbf ft).
In case of incorrect start-up procedures, the torque limiter prevents any kicks, resulting in inversion of rotation direction of the crankshaft which would impair the engine structure.



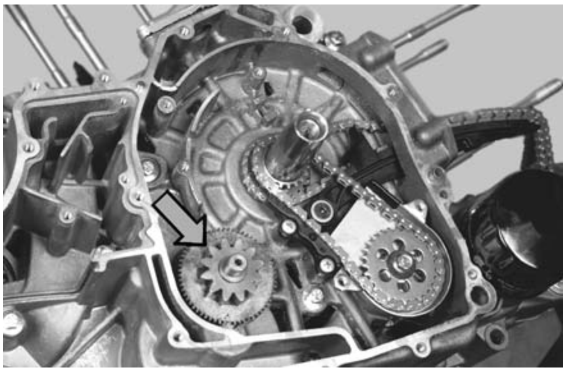
The limiter assembly cannot be overhauled. In case of clearly visible irregularities on the toothed discs, replace the assembly.

Fitting the idle gear

- Grease the gear housing on the engine crankcase.



- Fit the intermediate gear with torque limiter.



- Lubricate the internal bushing and the starter ring gear hub surface.

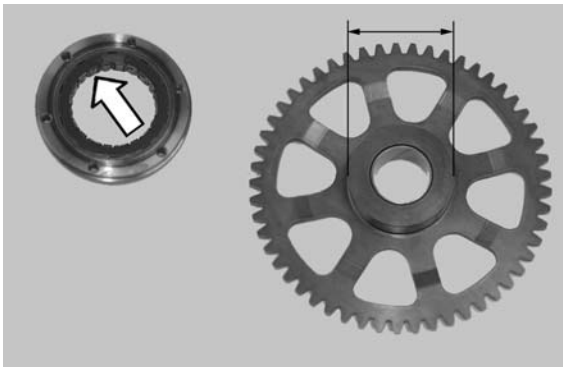


- Fit the starting ring gear on the flywheel by turning it clockwise and inserting the gear at the same time.



Removing the starter gear

- Check that there is no wear or abnormal marks on the «rollers» of the freewheel and on the surface of the starter ring gear hub.
- Check the hub outside diameter.

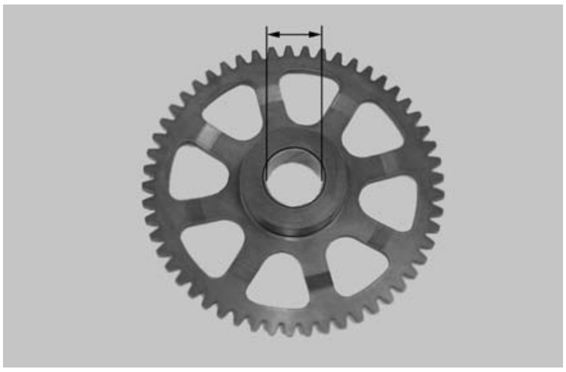


Characteristic

Hub outside diameter

45.665 mm (+0.008; +0.005) mm (1.79 in (+0.0003; + 0.0002) in)

- Check the inside diameter of the start-up gear bushing.
- Check that the toothing is not worn.



Characteristic

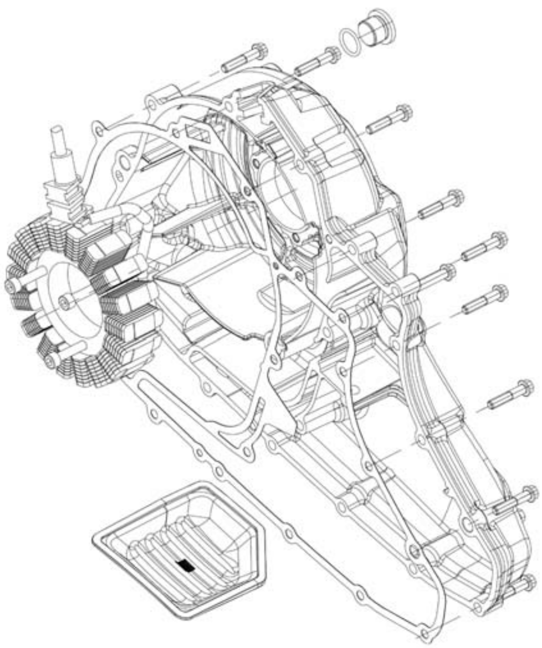
Bushing inside diameter

27 mm (+0.020; +0.041) mm (1.0629 in (+0.0008; 0.0016) in)

NOTE

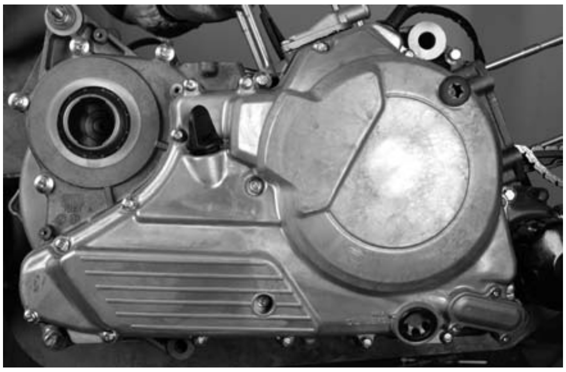
IF THE FAULTS FOUND AFFECT THE HUB, IT IS EXPEDIENT TO REPLACE THE STARTING RING GEAR AND THE FREEWHEEL.
IF ONLY THE BUSHING IS WORN, REPLACE ONLY THE COMPLETE STARTING RING GEAR.
ALSO CHECK THE DIAMETER AND THE SURFACE OF THE BEARING ON THE CRANKSHAFT.
IN CASE OF IRREGULARITIES, REPLACE THE CRANKSHAFT.

Generator side



Removing the flywheel cover

- Undo the sixteen screws fixing it to the crank-case.



- Remove the flywheel cover.

NOTE

THE COVER OFFERS RESISTANCE DUE TO THE FLYWHEEL MAGNETIC FIELD.

Magneto flywheel removal

- Lock the flywheel and tighten the nut fixing it to the shaft with the specific tool.

Specific tooling

020713Y Flywheel extractor



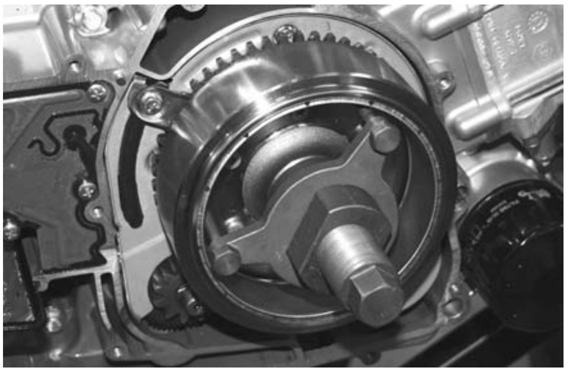
- Fit the specific extractor, and unlock the flywheel operating the tool.

CAUTION

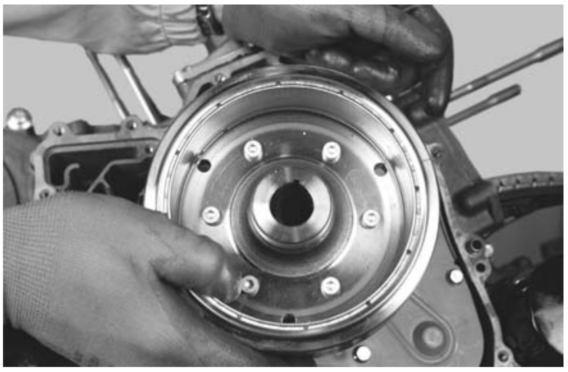
THE THREAD IS ANTICLOCKWISE.

Specific tooling

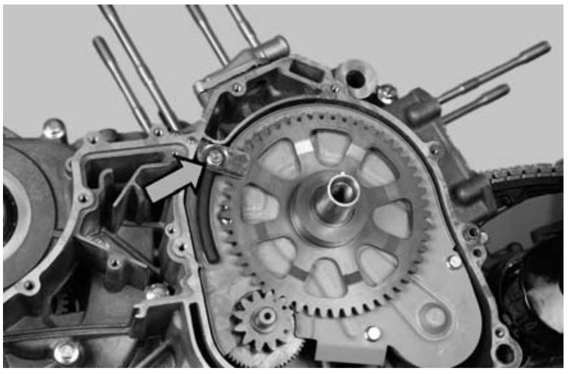
020713Y Flywheel extractor



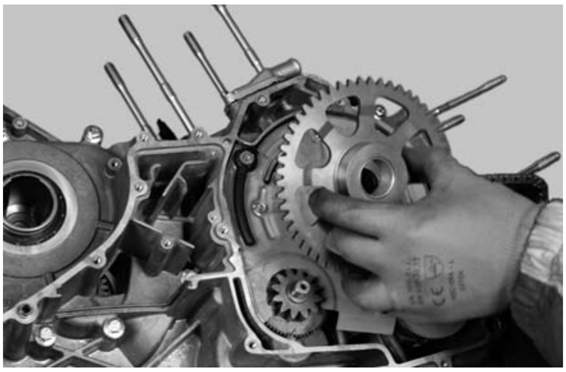
- Once it is unlocked, remove the flywheel with the freewheel.



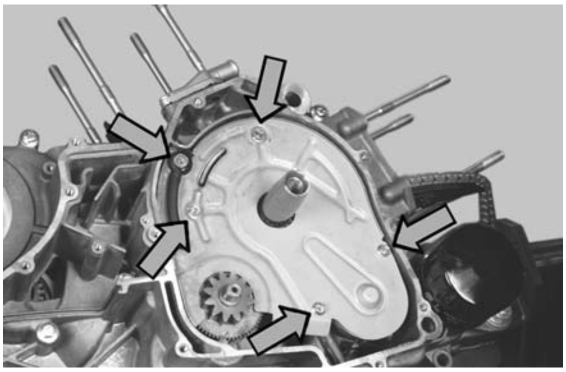
- Undo the plate fixing screw.



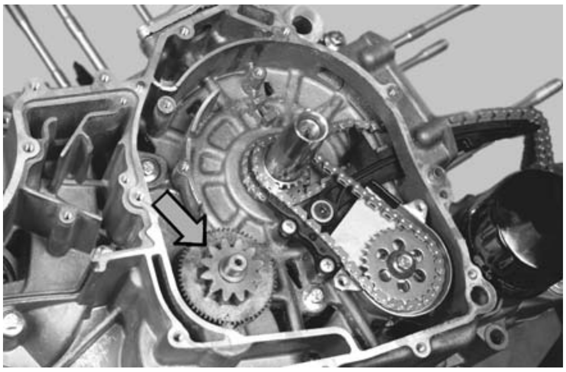
- Remove the starting ring gear.



- Undo the five fixing screws and remove the oil pump compartment closing bulkhead.

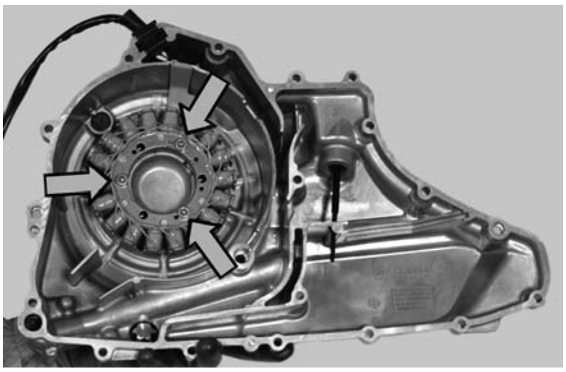


- Remove the intermediate gear.



Removing the stator

- Undo the 3 fixing screws and remove stator with the cable harness.



Inspecting the cover components

- Check the condition of the stator and of the relevant cable harness.



- Check the continuity between the 3 phases.

NOTE

THE VALUES ARE STATED AT AMBIENT TEMPERATURE. A CHECK WITH THE STATOR AT OPERATING TEMPERATURE MAY RESULT IN VALUES HIGHER THAN THOSE STATED.

Electric characteristic

Resistance:

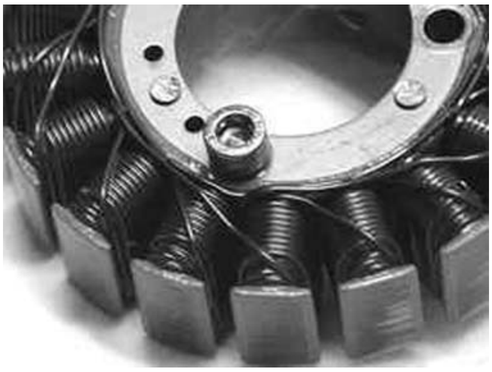
0.2 ÷ 1 Ω



- Check the earth insulation of each phase.
- If faults are found, check the cable thoroughly as it consists of two types of cables: rigid cables close to the stator and flexible cables close to the connector.



- Check that the winding is placed so as not to interfere with the heads of the fixing screws.



Flywheel components check

- Check that the magnets are in good conditions.
- Check that the magnet support cage is not deformed or broken.



Checking the starter clutch

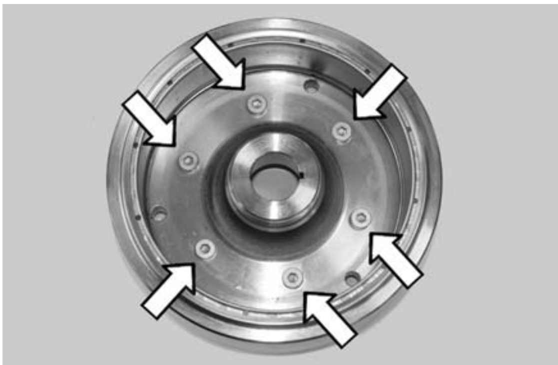
- Make sure the freewheel faying surfaces are in good condition.
- Thoroughly clean the freewheel to remove any LOCTITE left.
- Degrease the threading of the freewheel holes and the fixing screws.
- Apply the recommended product to the end of the screws.

Recommended products

Loctite 243 Medium strength threadlock

-

- Fit the freewheel on the magneto flywheel, making sure that the ground side is in contact with the flywheel, that is the wheel Seeger ring should be visible.
- Tighten the 6 fixing screws in a criss-cross sequence to the prescribed torque.

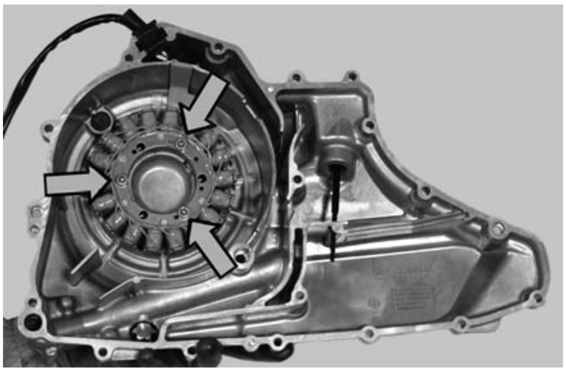


- Lubricate the freewheel «rollers».



Stator installation

- Fit the stator together with the cable harness, fixing the 3 screws to the prescribed torque.



NOTE

INSERT THE SEALING GASKET OF THE RUBBER WIRING INTO THE SPECIFIC SEAT ON THE CRANKCASE.

Locking torques (N*m)

Stator clamps 8 - 10

Flywheel cover installation

- Follow the removal steps but in reverse order; be careful to tighten to the prescribed torque with the specific tool.

CAUTION

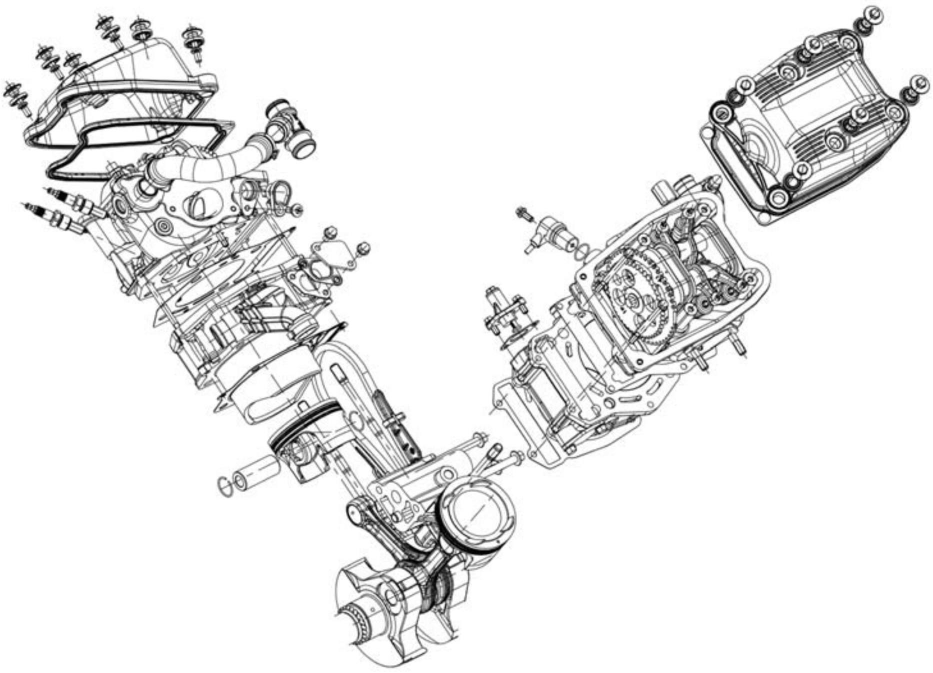
CLOSING THE COVER MAY POSE A RISK TO THE OPERATOR DUE TO THE STRONG MAGNETISM OF THE FLYWHEEL. BE SPECIALLY CAREFUL WITH YOUR HANDS.

Locking torques (N*m)

Flywheel cover screws 11 - 13

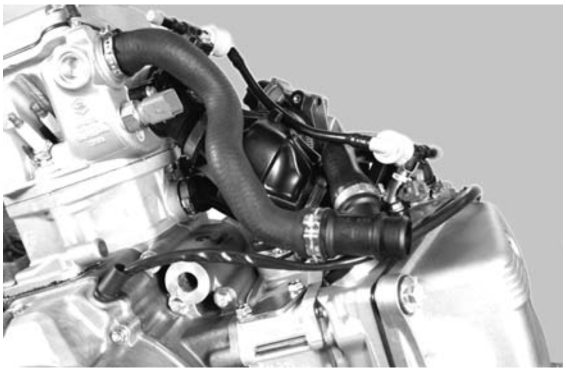
Head and timing

Diagram

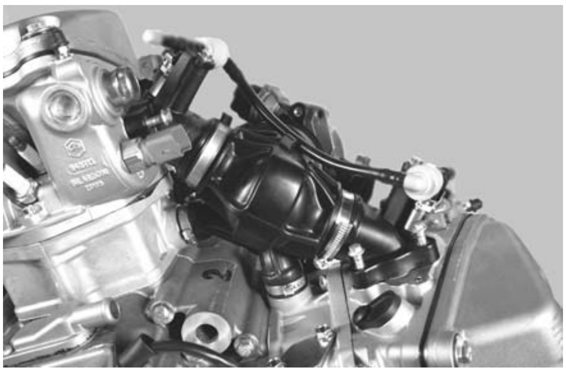


Removing the intake manifold

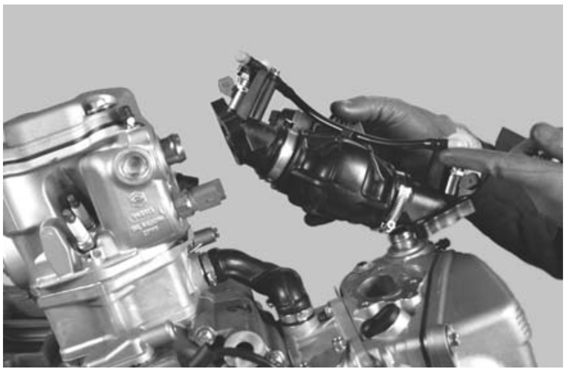
- Remove the coolant pipes.



- Undo the six fixing screws.



- Remove the inlet manifold.



Removing the head cover

- Undo the 6 special screws with stop and the relevant rubber gaskets.
- Remove the tappet cover with the relevant gasket.

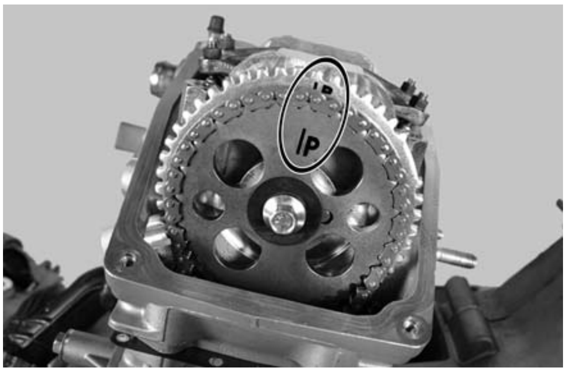


Removing the timing control

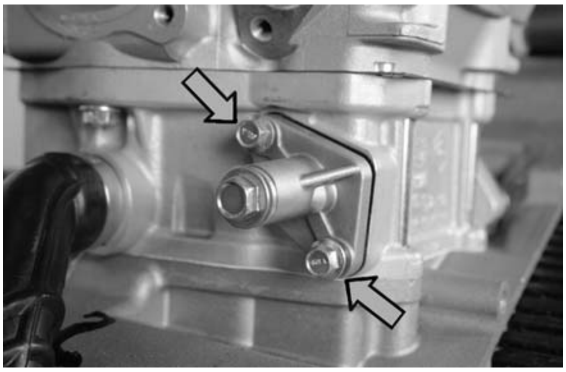
- As indicated in the photograph, align the references on the timing system gear of the rear cylinder with the reference on the valves cap.

NOTE

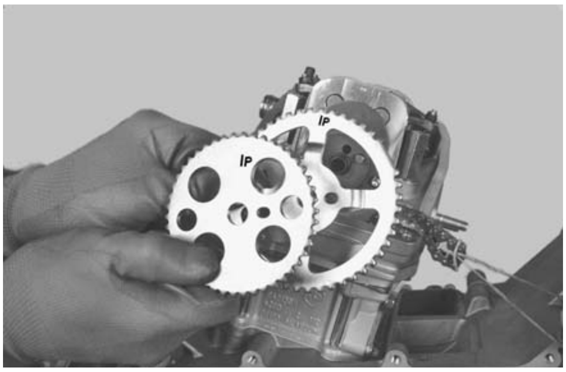
PLACING THE ENGINE AS INDICATED, IT IS IN THE COMBUSTION PHASE AND ALL THE VALVES ARE CLOSED. THIS FACILITATES FITTING-REMOVAL OPERATIONS.



- Loosen the central screw of the tensioner.
- Unscrew the two retainers indicated in the photograph and remove the tensioner with the relevant gasket.



- Lock the timing system gear with the specific tool, undo the central fixing screw and collect the washer.
- Release the chain from the sprocket and be careful that it does not fall inside the transmission housing.
- Remove the timing system gear and the tone wheel from the camshaft.



CAUTION

THE TONE WHEEL IS ONLY ON THE REAR CYLINDER. IN THE FRONT CYLINDER IT IS REPLACED BY A SPACER.

Specific tooling

8106702 Clutch bell calliper spanner

- Repeat the operations for the front cylinder timing system gear.

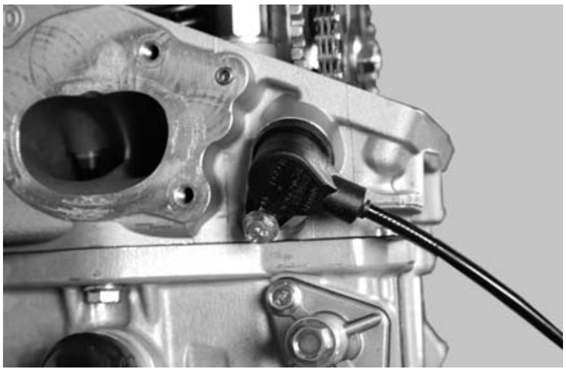
Removing the cylinder head

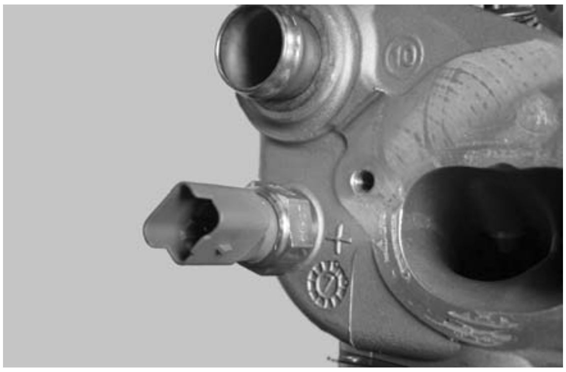
- The head removal operation is carried out in two separate stages, first on the rear cylinder, then on the front one.
- If the heads are removed together with the valves and the camshaft, follow the recommendations.

NOTE

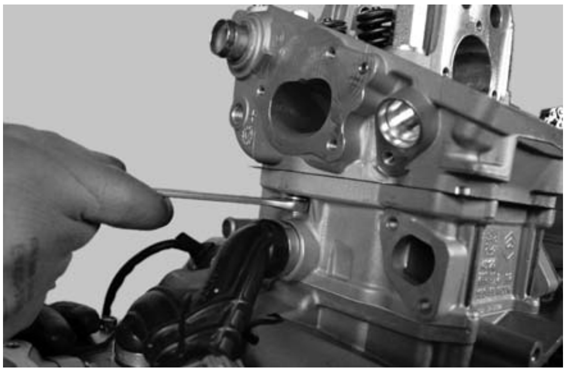
THE HEADS MUST BE CORRECTLY REMOVED WITH THE PISTONS AT TDC AND THE VALVES CLOSED.

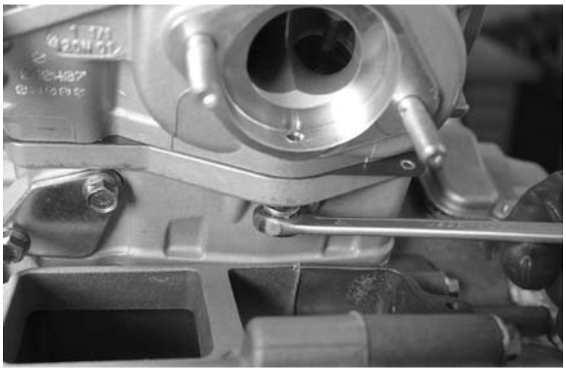
- Remove the engine revolution sensor and the water temperature sensor, fitted only on the rear cylinder head.



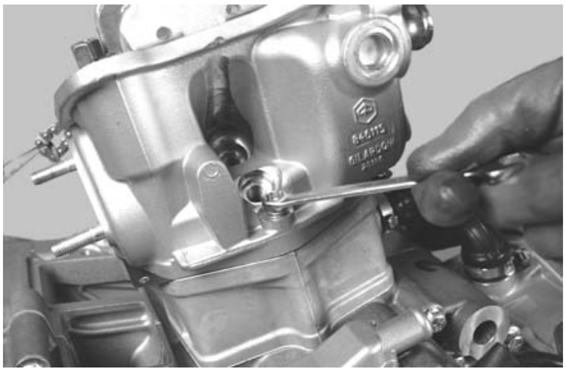


- The operations are described only once, but they are valid for both heads.
- Remove the spark plugs.
- Unscrew the two fixing nuts and collect the washers.

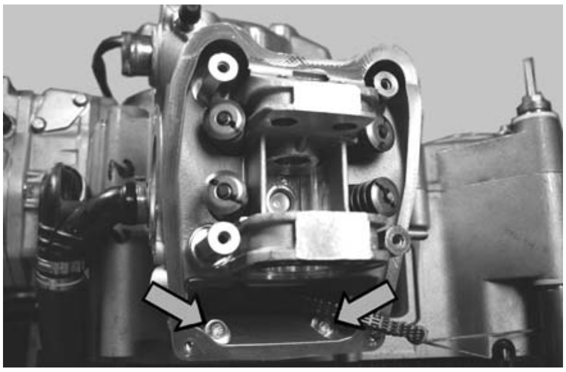




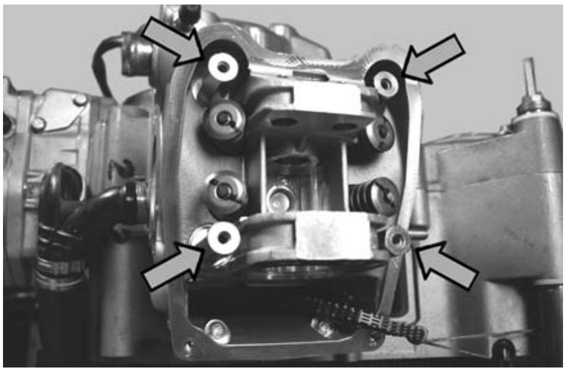
- Undo the spark plug side screw.



- Undo the two screws inside the head, timing system side.



- Loosen the 4 head-cylinder fixing nuts in two or three stages and in a criss-crossed sequence.
- Remove the head, the two centring dowels, the gasket and the lower chain guide slider.



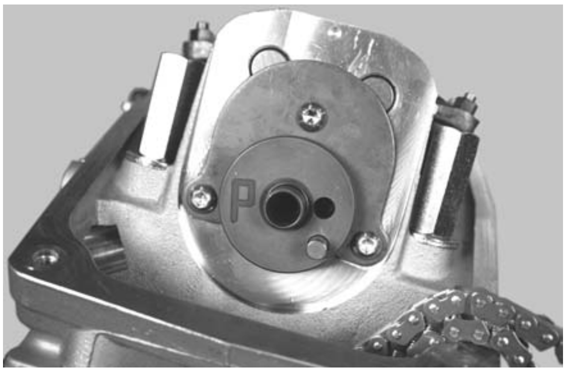
Cylinder head

Removing the overhead camshaft

- Remove the 3 fixing screws and the camshaft retaining bracket.

NOTE

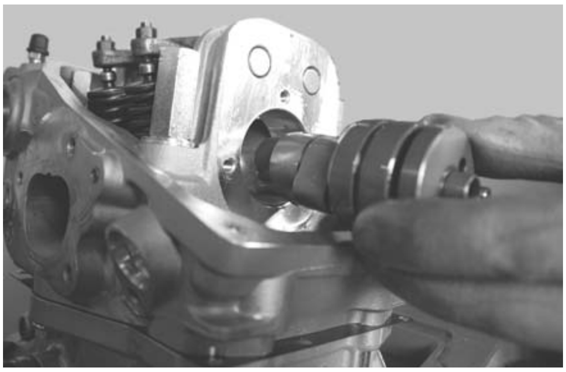
REMOVING THE FIXING SCREWS MAY BE DIFFICULT. BE CAREFUL NOT TO DAMAGE THE INTERNAL HEXAGON. IF NECESSARY, DETACH THE THREADS IN ADVANCE.



- Remove the camshaft.

CAUTION

THE TWO CAMSHAFTS ARE DIFFERENT ONE FROM THE OTHER. IT IS POSSIBLE TO IDENTIFY THEM BY LETTER "A" (FRONT) OR "P" (REAR) STAMPED ON THE EXTERNAL SHOULDER, CROWN GEAR SIDE.



- Remove the pins and the rocking levers acting from the transmission side holes.



Removing the valves

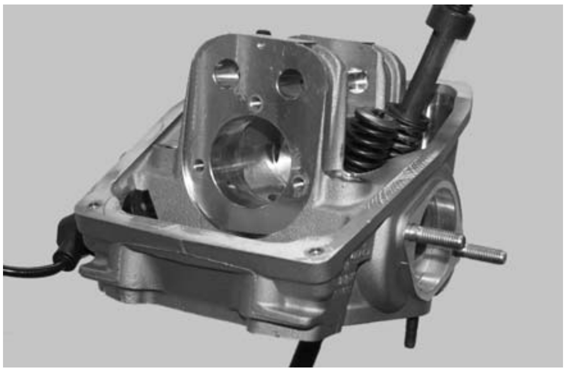
- Using the appropriate tool fitted with an adapter, remove the cotter pins, plates, springs and valves.

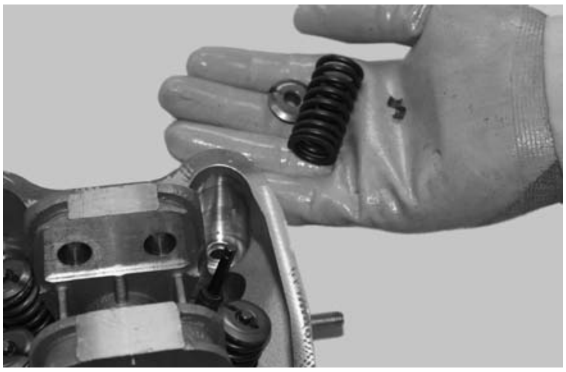
Specific tooling

AP0276474 Valve spring compressor adaptor

CAUTION

ARRANGE THE VALVES SO AS TO RECOGNISE THEIR ORIGINAL POSITION ON THE HEAD (FLYWHEEL SIDE AND TRANSMISSION SIDE).

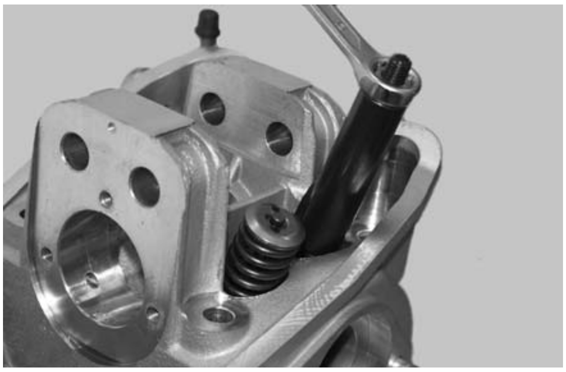


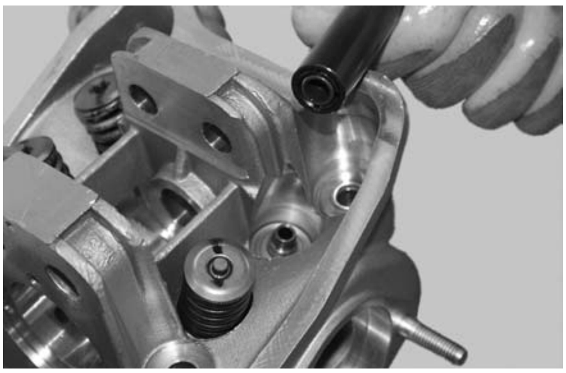


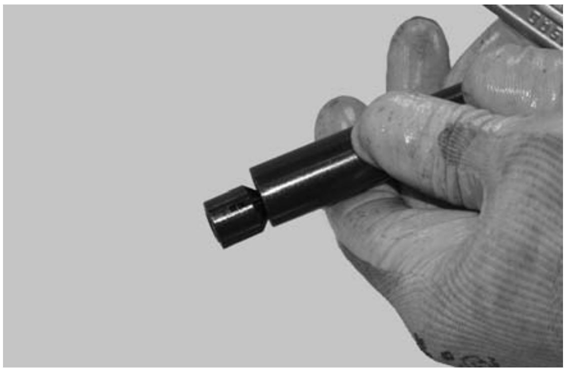
- Remove the oil seals with the specific tool

Specific tooling

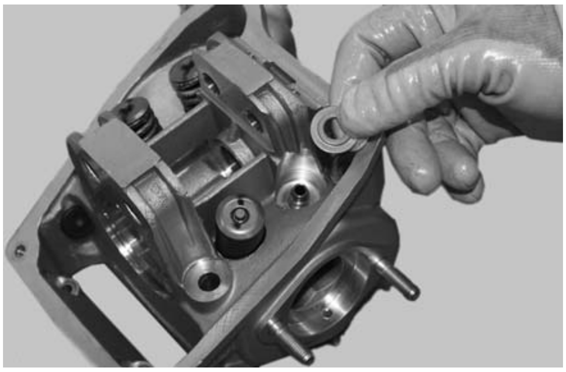
020431Y Valve oil seal extractor







- Remove the spring supports.

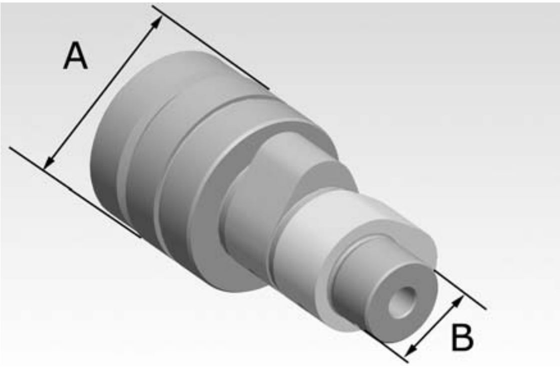


NOTE

BLOW THE SEATS WITH COMPRESSED AIR TO FACILITATE REMOVING THE SPRING SUPPORTS.

Checking the overhead camshaft

- Check the camshaft bearings for signs of abnormal wear or scores.
- Using a micrometer, measure the camshaft bearings.



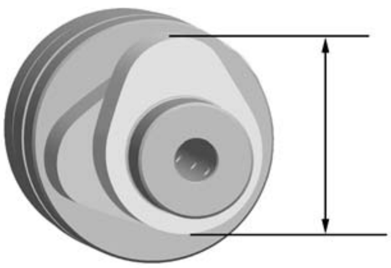
STANDARD DIAMETER

Specification	Desc./Quantity
Bearing A Ø:	42- 0.060 -0.085 mm
Bearing B Ø:	20- 0.020 -0.041 mm

MINIMUM DIAMETER ALLOWED

Specification	Desc./Quantity
Bearing A Ø:	41.910 mm
Bearing B Ø:	19.940 mm

- Using a gauge, measure the height of the cams.



LIMITS ALLOWED

Specification	Desc./Quantity
Inlet:	33.740 mm
Outlet:	33.170 mm
Standard axial clearance:	0 ÷ 0.22 mm
Maximum axial clearance allowed:	0.3 mm

STANDARD HEIGHT

Specification	Desc./Quantity
Inlet:	33.988 mm
Outlet:	33.417 mm

- Check there are no signs of wear on the contact pads with the cam and on the articulated plate of the set screws.
- In case of wear, replace the component.

- Check there are no signs of wear or scoring on the rocking lever pins.

Characteristic

Standard diameter:

Ø 13 - 0.010 -0.018 mm

See also

Assembly clearances

Checking the rocker arms

- Check the inside diameter of each rocking lever.

Characteristic

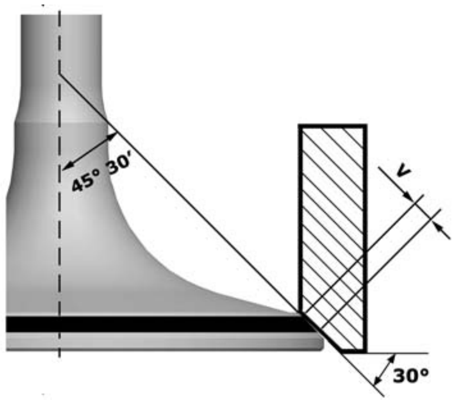
Standard diameter:

Ø 13 + 0.026 +0.015 mm



Valve check

- Remove any carbon deposits from the valve seats.
- Check the width of the mark on the valve seat «**V**» with Prussian blue.



Characteristic

Standard value:

1 ÷ 1.3 mm

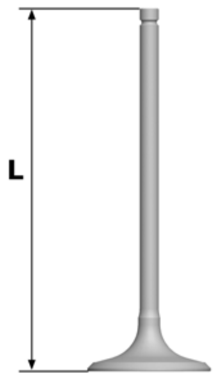
Limit allowed:

1.6 mm

- If the width of the mark on the valve seat is larger than the prescribed limits, true the seats with a 45° mill and then grind.
- Replace the head in case of excessive wear or damage.

VALVE STANDARD LENGTH

Specification	Desc./Quantity
Inlet:	95.0 ± 0.3 mm
Outlet:	94.2 ± 0.3 mm



- Measure the diameter of the valve stem at the three positions indicated in the diagram.

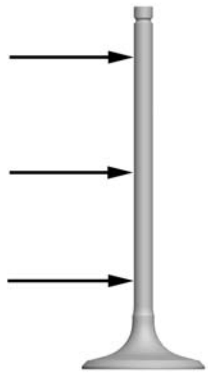
STANDARD DIAMETER

Specification	Desc./Quantity
Inlet:	4.987 ÷ 4.972 mm
Outlet:	4.975 ÷ 4.960 mm

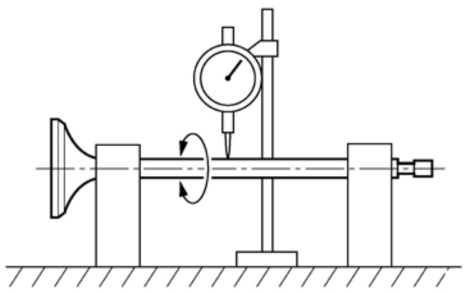
MINIMUM DIAMETER ALLOWED

Specification	Desc./Quantity
Inlet:	4.96 mm
Outlet:	4.945 mm

- Calculate the clearance between the valve and its guide.



- Check the deviation of the valve stem by resting it on a "V" shaped support and measuring the extent of the deformation using a dial gauge.

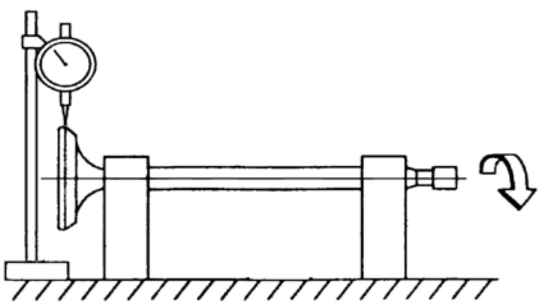


Characteristic

Limit value allowed:

0.1 mm

- Check the concentricity of the valve head by placing a dial gauge at a right angle with respect to the valve head and rotating it on the "V" shaped support.



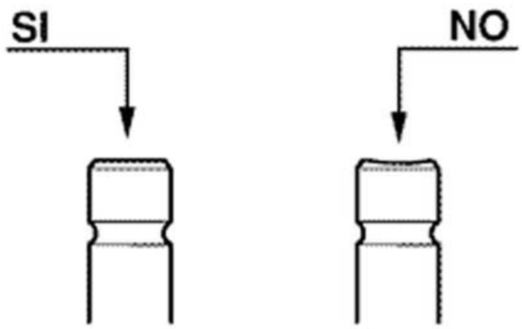
Characteristic

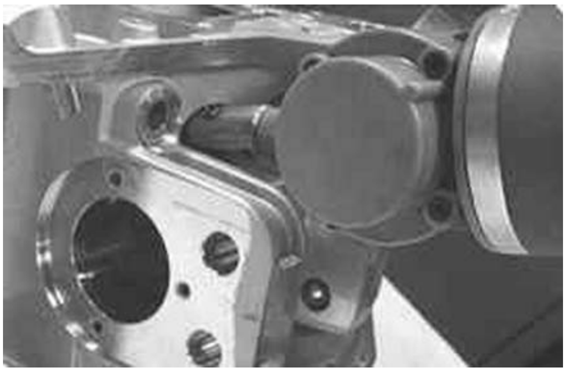
Limit allowed:

0.03 mm

- Check that there are no signs of wear on the faying surface with the set screw articulated end and that its surface is smooth and not concave.
- If no anomalies are found during the above checks, the same valves can be reused.

For better sealing results, it is advisable to grind the valves. Grind the valves gently with fine-grained lapping compound. Upon grinding, keep the cylinder head with the valve axles in a horizontal position. This will prevent the lapping compound residues from penetrating into the stem-valve guide coupling.





CAUTION

TO AVOID SCORING THE FAYING SURFACE, DO NOT ROTATE THE VALVE WHEN NO LAPPING COMPOUND IS LEFT. CAREFULLY WASH THE CYLINDER HEAD AND THE VALVES WITH A SUITABLE PRODUCT FOR THE TYPE OF LAPPING COMPOUND BEING USED.

CAUTION

DO NOT CHANGE THE VALVE FITTING POSITION (RH - LH).

See also

Installing the cylinder head

Inspecting the valve sealings

- Fit the valves into the cylinder head.
- Alternatively test the intake and outlet valves.
- The test should be carried out by filling the manifold with fuel and checking that the head does not ooze through the valves when they are just pressed by the fingers.



See also

Installing the cylinder head

Inspecting the springs and half-cones

- Check that the upper and lower supporting spring plates, the cotters and the oil seal show no sign of abnormal wear. Otherwise, replace the component.

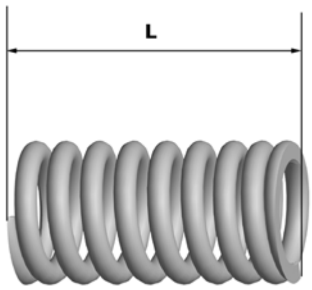


- Measure the unloaded spring length.

NOTE

TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.

- Measure the unloaded spring length.



Characteristic

Standard length:

44.4 mm

Limit allowed after use:

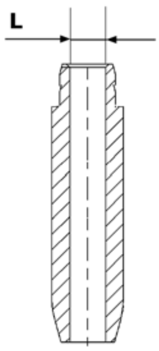
42.4 mm

See also

Installing the cylinder head

Checking the valve guides

Measure the valve guides.



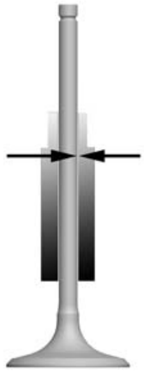
Characteristic

Valve guide:

5+0.012 mm

- After measuring the valve guide diameter and

the valve stem diameter, check the clearance between guide and stem.



EXHAUST

Specification	Desc./Quantity
Standard clearance:	0.025 ÷ 0.052 mm
Limit allowed:	0.09 mm

INLET

Specification	Desc./Quantity
Standard clearance:	0.013 ÷ 0.04 mm
Limit allowed:	0.08 mm

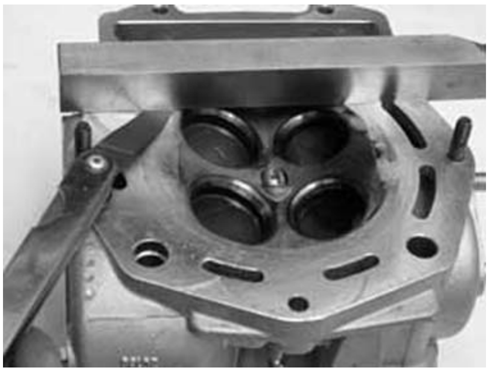
See also

Installing the cylinder head

Checking the cylinder head

Clean all the coupling surfaces thoroughly before servicing the head. Pay attention to the position of the springs and valves so as not to change the original position upon refitting them

- Using a trued bar and a thickness gauge, check that the cylinder head surface is not worn or distorted.



Characteristic

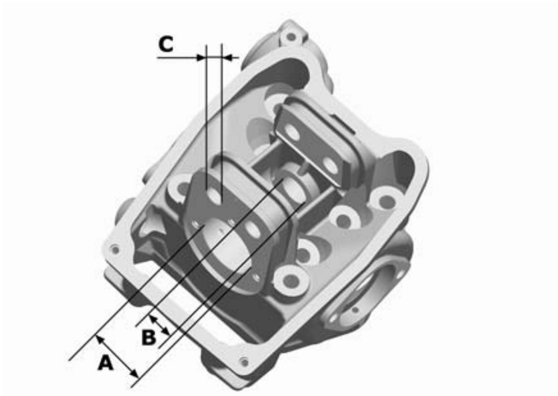
Maximum run-out allowed:

0.1 mm

- In case of irregularities, replace the head.
- Check the sealing surfaces for the inlet and exhaust manifold.
- Check that the camshaft and the rocker pin bearings show no signs of wear.
- Check that the head cover show no signs of wear.

- Check that the coolant sealing buffer is not rusted.

Measure the camshaft seat bearings and rocking lever support pins with a bore meter

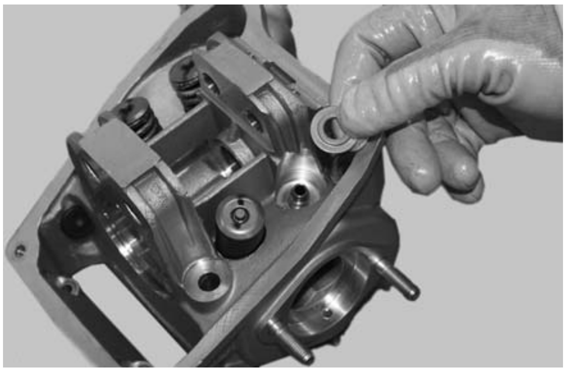


HEAD BEARINGS

Specification	Desc./Quantity
Bearing "A"	42 +0.025
Bearing "B"	19.5 -0.2
Bearing "C"	13 +0.018

Installing the valves

- Place the valve spring supporting plates on the head.



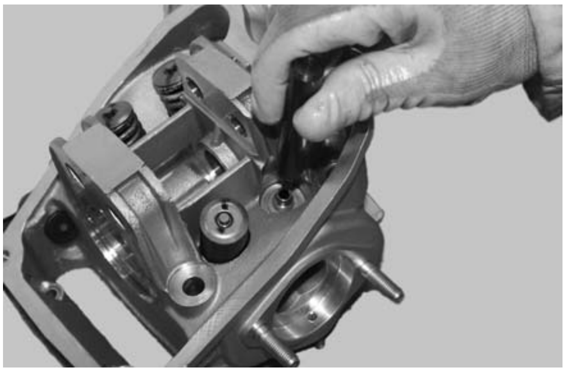
- Fit the four oil seals alternately with the specific tool.

Specific tooling

020306Y Punch for fitting the valve sealing rings







- Lubricate the oil seals and the valve guides.

- Fit the valves, the springs and the plates.



- With the specific tool fitted with the appropriate adaptor, compress the springs and fit the cotters in their seats.



Specific tooling

020382Y Tool for removing valve cotters fitted with part 012

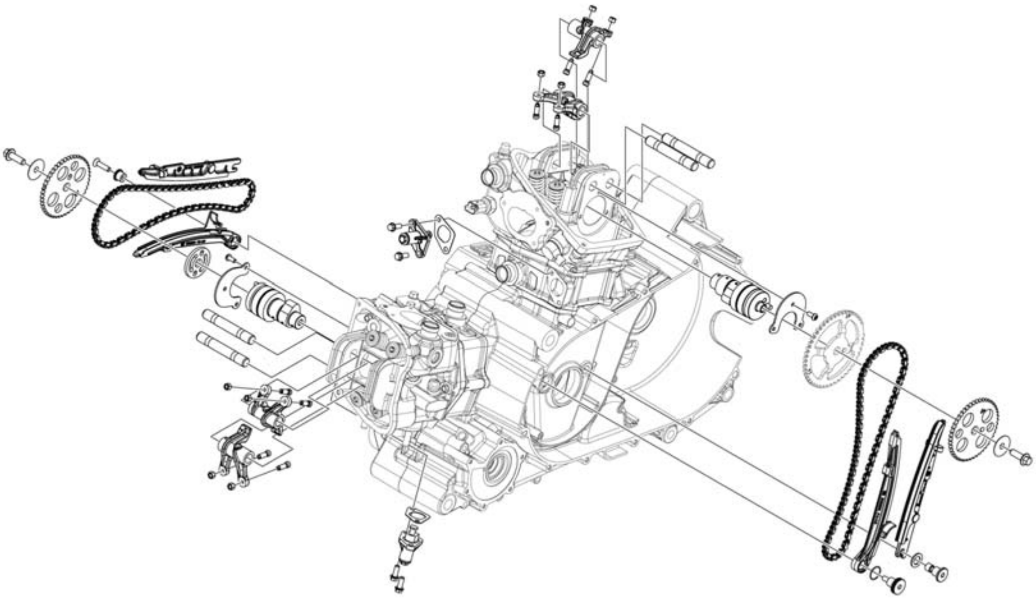
020382Y012 bushing (valve removing tool)

NOTE

DO NOT CHANGE THE VALVE FITTING POSITION. FIT THE VALVE SPRINGS WITH THE REFERENCE COLOUR ON THE COTTERS SIDE (TURNS WITH

GREATER PITCH).

Timing



Removing the chain tensioner

- Remove the central screw, collect the washer and the spring carefully.



Checking the chain tensioner

- Check that the one-way mechanism is not worn.
- Check the condition of the tensioner spring.
- If signs of wear are found, replace the whole assembly.

Checking the chain

- Check the chain, camshaft control timing system gear and crankshaft pinion for wear. In case of ex-

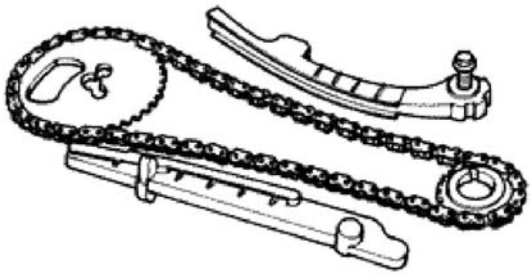
cessive wear, replace the entire chain-crown-pinion unit.

CAUTION

IF THE CHAIN HAS DAMAGED THE PINION, REPLACE THE CRANKSHAFT.

Checking the sliders

- Check that the guide slider and the tensioner pad are not excessively worn.
- Replace the sliders if they are worn.



Cam timing

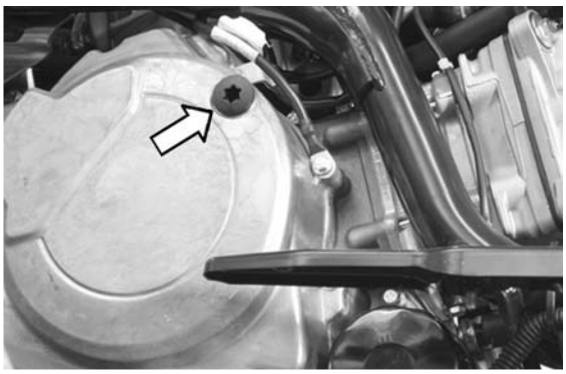
The ignition advance is determined electronically on the basis of parameters known by the control unit. For this reason it is not possible to state the reference values based on the engine revs.
The ignition advance value can be measured at any time with the diagnostic tester.
It is possible to check whether the ignition advance determined by the injection system does in fact correspond with the value actually activated on the engine, by means of the stroboscopic light.

Specific tooling

020460Y Scooter tester and diagnosis

020330Y Stroboscopic light for timing checking

- Unscrew the TDC reference inspection cap.
- Connect the stroboscopic light.



- Connect the diagnostic tester.
- Start the engine.
- Select the «parameter» function from the menu.

- Select the stroboscopic light control in the traditional four-stroke engine position (1 spark, 2 revs).
- Check that the real values of revs and ignition advance match those measured using the diagnostic tester.
- Refit the inspection cap on the flywheel side.

Specific tooling

020460Y Scooter tester and diagnosis

If the values do not correspond, check:

- distribution timing
- rpm timing sensor
- injection control unit

Timing

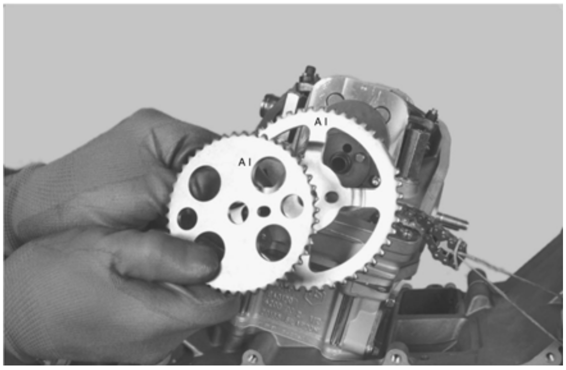
- With the TORX wrench, remove the timing check cap.



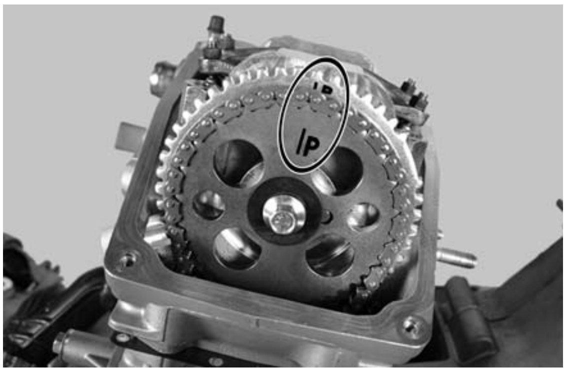
- With the references aligned, operate on the driving pulley to turn the crankshaft until on the flywheel the rear cylinder timing reference mark «**1**» is aligned to the crankcase reference, corresponding to the rear piston top dead centre.



- Fit the tone wheel and the timing system gear with the chain and align the reference marks.



- Once the reference marks are aligned as indicated with the reference marks on the valve cam cap, tighten the screw with the washer to the prescribed torque.



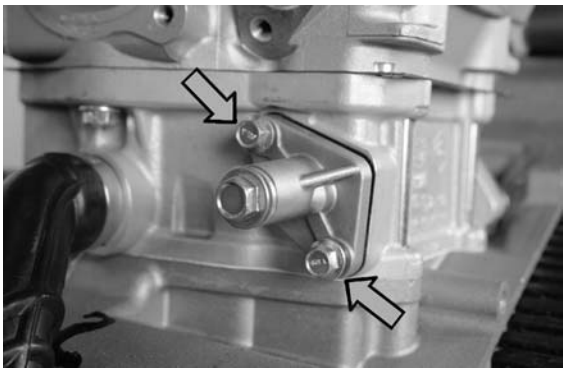
Locking torques (N*m)

Timing system crown screw on camshaft 12 ÷ 14

- Place the tensioner slider at the rest position, keeping the retaining tab pressed.



- Insert the chain tensioner in the cylinder with the gasket and tighten the screws to the prescribed torque.



Locking torques (N*m)

timing chain tensioner screws 11 ÷ 13

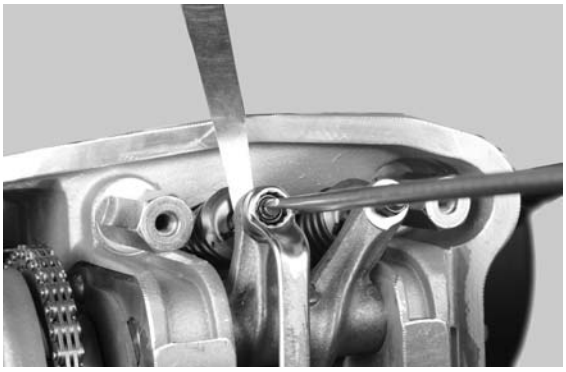
- Check and if necessary, restore the correct clearance of the valves.

Characteristic

Valve clearance

Inlet: 0.15 mm

Outlet: 0.15 mm



- Turn the crankshaft in the normal operating direction until the reference mark "A" on the tone wheel is aligned with the rear head reference, so as to take the front piston to the top dead centre.



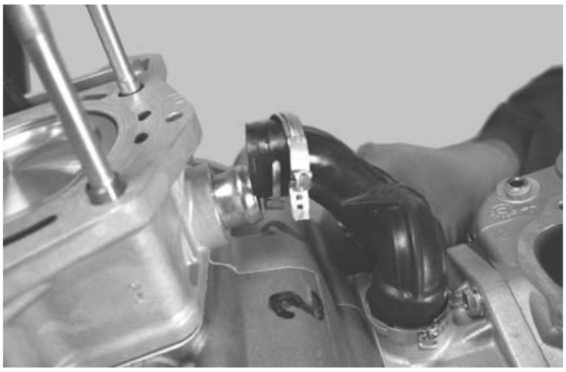
- Check that the front cylinder phase reference mark "2" is aligned with the crankcase reference mark.



Cylinder-piston assembly

Removing the cylinder

- Remove the coolant inlet pipes.
- The described operations refer to one cylinder but apply to both.



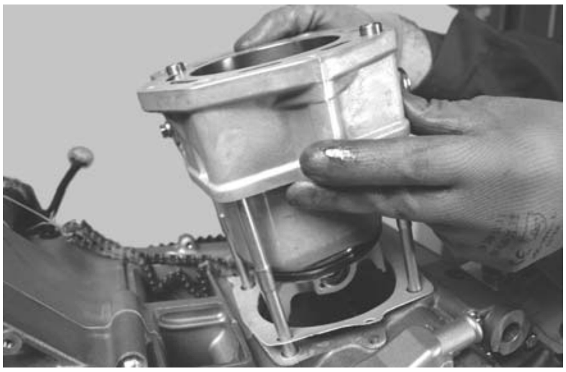
- Slide off the cylinder with the relevant gasket and the centring dowel.

NOTE

THE SECOND CENTRING IS ENSURED BY A DOWEL SET INTO THE CYLINDER.

CAUTION

TO AVOID DAMAGING THE PISTON, KEEP IT FIRM WHILE REMOVING THE CYLINDER.



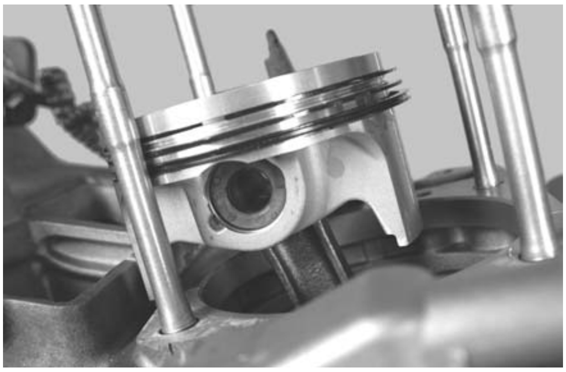
Disassembling the piston

- Remove the head.

- Remove the 2 piston pin snap rings operating through the specific slots.
- Slide off the pin and remove the piston.

NOTE

USE PAPER OR A CLOTH TO CLOSE THE CYLINDER HOUSING MOUTH ON THE CRANKCASE TO PREVENT ONE OF THE TWO PIN SNAP RINGS FROM FALLING INSIDE.



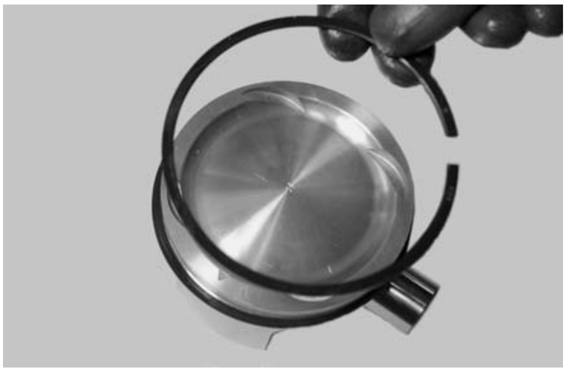
- Remove the piston sealing rings and the scraper ring.

CAUTION

PAY ATTENTION TO THE FITTING POSITIONS OF THE RINGS TO PREVENT INVERTING THE POSITION IN CASE THEY ARE REUSED.

NOTE

BE CAREFUL NOT TO DAMAGE THE SEALING RINGS DURING REMOVAL.



See also

Removing the cylinder head

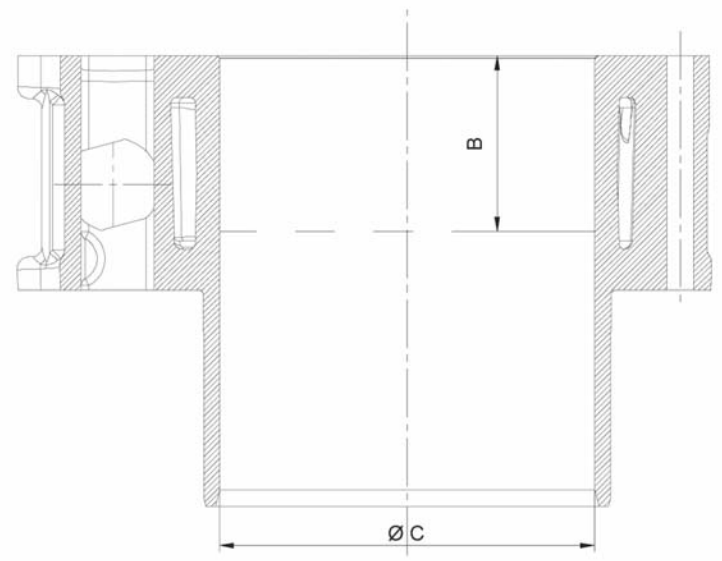
Checking the cylinder

- All seal surfaces must be clean and flat.
- Make sure all threads are in proper conditions.
- Check cylinder sliding surface for signs of friction and scratches. Also check the seal surfaces for damages.

CAUTION

IF THE GROOVES ON THE CYLINDER LINER ARE EVIDENT, REPLACE THE CYLINDER AND THE PISTON.

- Clean off lime scales on the cylinder cooling slots.



CYLINDER CHECK

Specification	Desc./Quantity
B	43 mm (1.69 in)
Cylinder Ø C	88 mm (+0.018; -0.01) mm (3.4645 in (+0.0007; -0.00039) in)

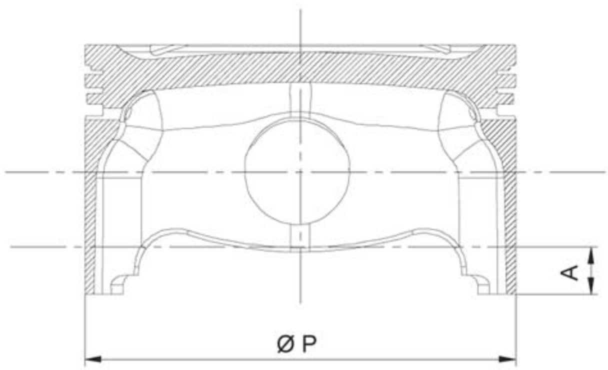
Characteristic

Maximum run-out allowed:

0.05 mm

Checking the piston

- Measure the piston diameter according to value A and check that the size measured is within the specified range.



PISTON CHECK

Specification	Desc./Quantity
A	10 mm (0.393 in)
Piston Ø P	87.968 mm (+/- 0.014 mm) (3.4632 in (+/- 0.0005)in)

Inspecting the wrist pin

NOTE

TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.

See also

Piston rings

Inspecting the piston rings

NOTE

TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.

See also

Piston rings

Checking the connecting rod small end

NOTE

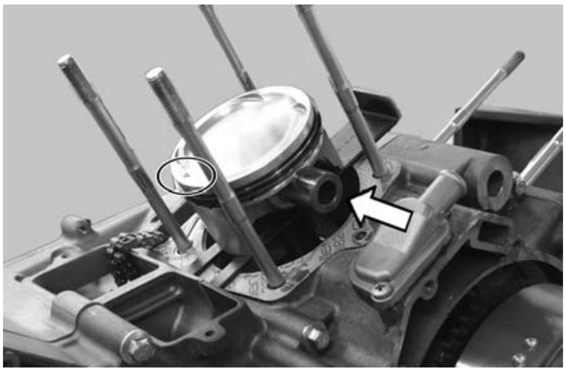
TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.

Fitting the piston

- Fit the piston and wrist pin onto the connecting rod, aligning the piston arrow towards the engine direction of rotation.

NOTE

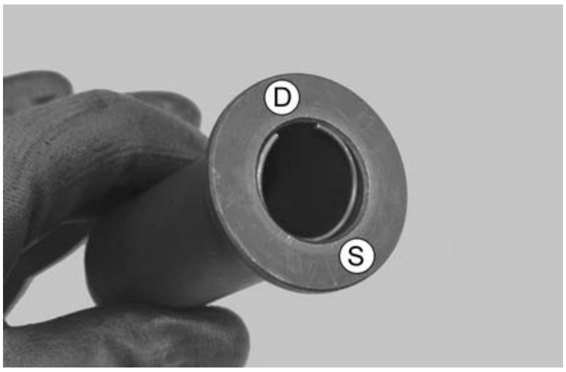
THE PISTON MUST BE FITTED WITH THE ARROW FACING TOWARDS THE EXHAUST SIDE, THE PISTON RINGS MUST BE FITTED WITH THE REFERENCE «TOP» OR THE STAMPED MARK FACING UPWARDS.



- Fit the pin snap ring in the specific tool, with the opening in the position indicated on the tool.

S = left

D = right



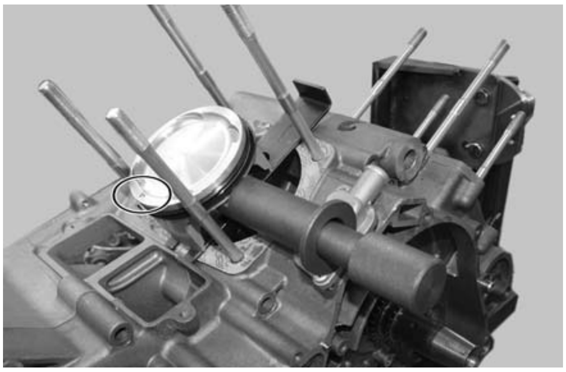
- Set the snap ring into its position with the punch.



- Fit the pin snap ring with the pin as shown in the figure.

Specific tooling

020470Y Pin snap ring fitting tool



NOTE

THE TOOL FOR INSTALLING THE STOP RINGS MUST BE USED MANUALLY.

CAUTION

USING A HAMMER MAY DAMAGE THE RINGS HOUSINGS.

Refitting the piston rings



- Place the oil scraper ring spring on the piston.
- Fit the oil scraper ring keeping the gap opposed to the spring union and the word "top" facing the piston crown. In any case, the chamfered side of the must be facing the piston crown.
- Fit the middle piston ring with the identification letter or the word "top" facing the piston crown. In any case, the tapered side of the ring must be facing opposite the piston crown.
- Fit the top compression ring in the direction forced by the housing.
- It is advisable to use a fitter to help fitting the rings.

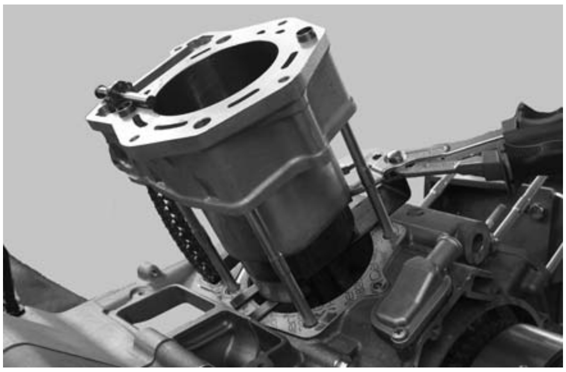
NOTE

THE 2 PISTON RINGS ARE MADE WITH A TAPERED CYLINDRICAL CONTACT SECTION. THIS IS TO OBTAIN A BETTER BEDDING.

- Offset the piston ring openings by 120º as shown in the figure.
- Lubricate the components with engine oil.
- The engine is fitted with a top ring with an L-shaped section.

Installing the cylinder

- Fit the cylinder base gasket of the chosen thickness.
- With the fork support and the retaining clamp, fit the cylinder as shown in the figure.



NOTE

BEFORE FITTING THE CYLINDER, CAREFULLY BLOW AIR INTO THE LUBRICATION DUCT AND LUBRICATE THE CYLINDER LINER. CHECK THAT THERE ARE TWO REFERENCE DOWELS.

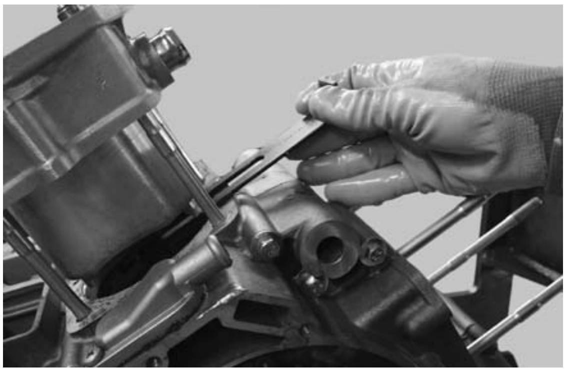
Specific tooling

AP8140302 tool for sealing ring fitting

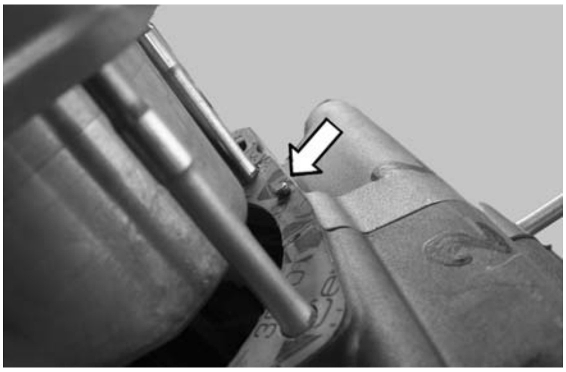
020512Y Piston fitting fork

- Remove the specific tool.





- Check that the centring dowel is correctly fitted and push the cylinder until it stops.



Selecting the base gasket

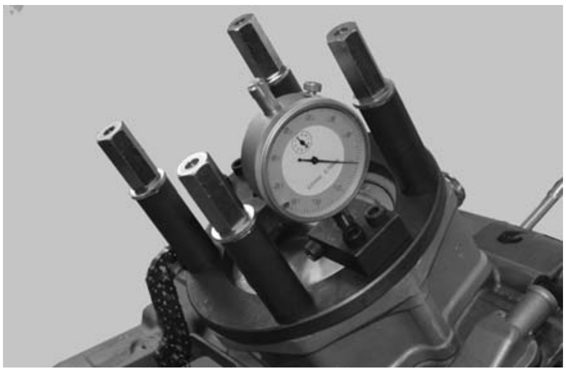
- First fit the piston into the cylinder, without any base gasket.
- Fit a dial gauge on the specific tool with the short union, as shown in the figure.

Specific tooling

020475Y Piston position checking tool

- With a contrasting surface, reset the dial gauge with a preloading of a few millimetres.
- Finally fix the dial gauge.
- Check the perfect sliding of the feeler pin.
- Fit the tool on the cylinder without changing the dial gauge position.
- Lock the tool with the original head fixing nuts.
- Rotate the crankshaft up to TDC (the reversal point of the dial gauge rotation).
- Measure the deviation from the reset value.



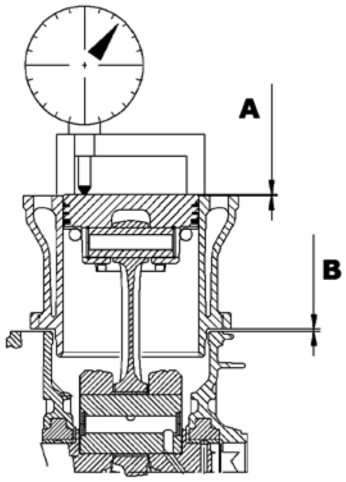


- By means of the chart, identify the thickness of the cylinder base gasket to be used upon refitting. By correctly identifying the cylinder base gasket thickness, an adequate compression ratio can be maintained
- Remove the specific tool and the cylinder.

NOTE

IF DEVIATIONS (PROTRUSIONS OR RECESSES) CLOSE TO THE CHANGE OF CATEGORY ARE MEASURED, REPEAT THE MEASUREMENT AT THE OPPOSITE SIDE. TO DO SO, REPEAT THE TOOL FITTING OPERATION, INVERTING ITS POSITION.

MEASUREMENT «A» IS A PROTRUSION OR RECESS VALUE OF THE PISTON CROWN COMPARED WITH THE CYLINDER PLANE. MEASUREMENT «A» ALLOWS TO DETERMINE THE THICKNESS OF THE GASKET «B» THAT HAS TO BE FITTED INTO THE CYLINDER BASE IN ORDER TO RESTORE THE COMPRESSION RATIO. THE MORE THE PLANE FORMED BY THE PISTON CROWN PROTRUDES BEYOND THE PLANE FORMED BY THE CYLINDER UPPER END, THE THICKER THE GASKET TO BE USED AT THE CYLINDER BASE «B» SHOULD BE. ON THE OTHER HAND, THE MORE THE PISTON CROWN IS RECESSED INTO THE CYLINDER TOP PLANE, THE SMALLER THE GASKET THICKNESS.



Characteristic

Compression ratio

10.5 ± 0.5 : 1

BASE GASKET THICKNESS

Name	Measure A	Thickness
MEASURE TAKEN «A»	- 0.185 ÷ - 0.10	0.4 ± 0.05
MEASURE TAKEN «A»	- 0.10 ÷ + 0.10	0.6 ± 0.05
MEASURE TAKEN «A»	+ 0.10 ÷ + 0.185	0.8 ± 0.05

NOTE

VALUES INDICATED WITH «-» REFER TO RECESSES OF THE PISTON CROWN FROM THE CYLINDER PLANE.

NOTE

SIZE «A» MUST BE MEASURED WITHOUT ANY GASKET FITTED AT «B»

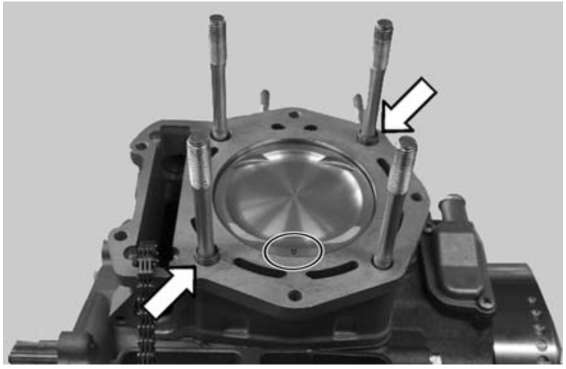
Installing the cylinder head

- The head is fitted in two separate stages.

- According to the indications described, fit the rear cylinder head and then the front cylinder head.

- Fit the chain guide slider.

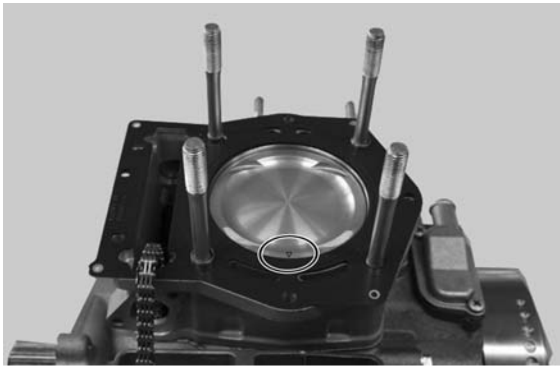
- Fit the two centring dowels between head and cylinder.



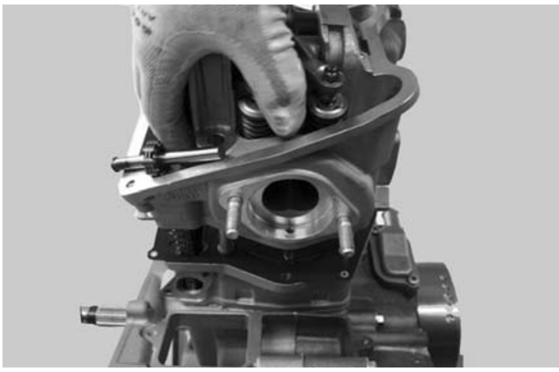
NOTE

THE FIGURE SHOWS THE FITTING POSITION OF THE TWO CENTRING DOWELS BETWEEN HEAD AND CYLINDER. THE DIRECTION OF FITTING FOR THE GASKET IS FORCED BY THESE DOWELS.

- Fit the head gasket
- The head gasket is made of steel and has a standard thickness.



- Check that the head lubrication channel is perfectly clean. Clean with short blasts of compressed air, if required.
- Fit the head.
- Lubricate the screw studs and the 4 fixing stud bolts.



- Tighten the 4 fixing stud bolts in a criss-crossed sequence to the prescribed torque as shown in the figure.

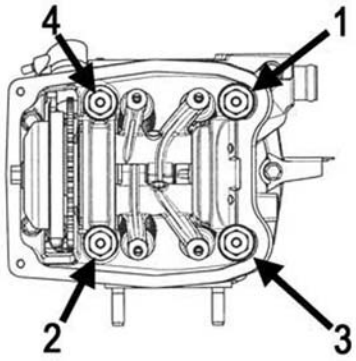
Locking torques (N*m)

Head fixing stud bolts ***

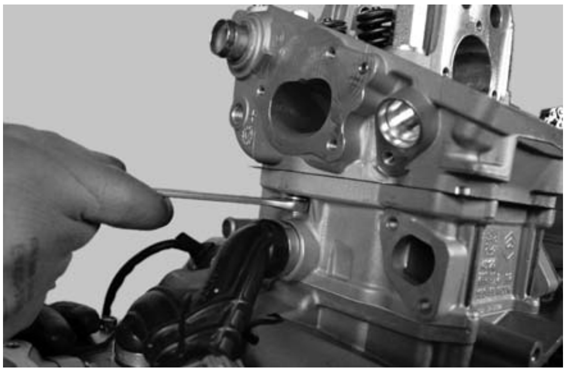
*** First, apply a preliminary torque of 10 Nm in a criss-crossed sequence.
- tighten to a torque of 13 Nm + 90° in a criss-

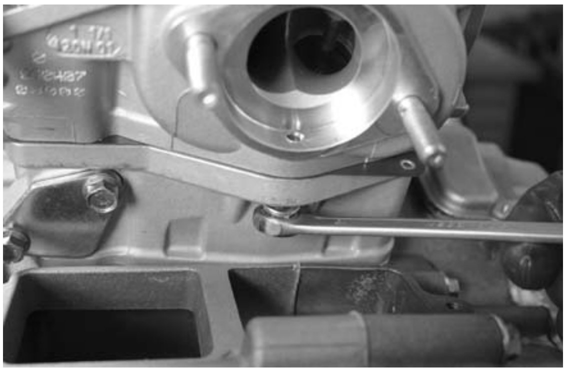
crossed sequence.

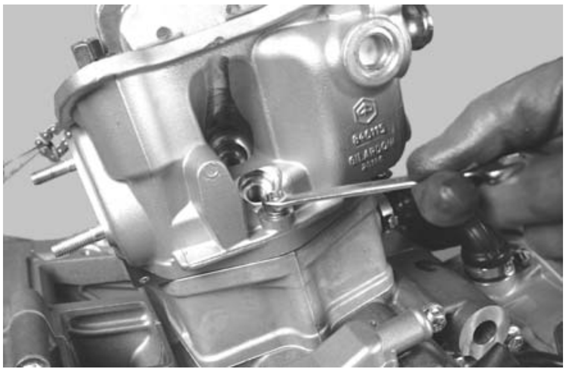
- tighten again at 90° in a criss-crossed sequence.



- Tighten the fixing nuts on the exhaust side and the intake side to the prescribed torque.







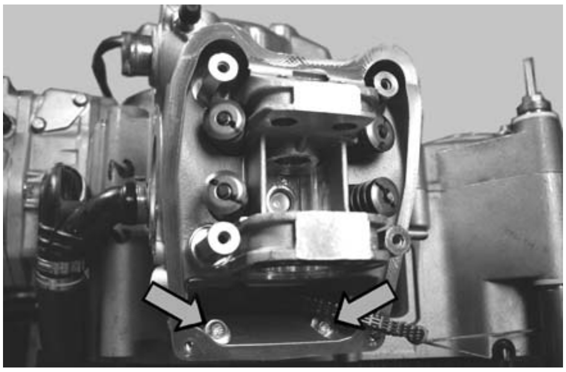
Locking torques (N*m)

Exhaust/ intake head fixing nuts 10 - 12

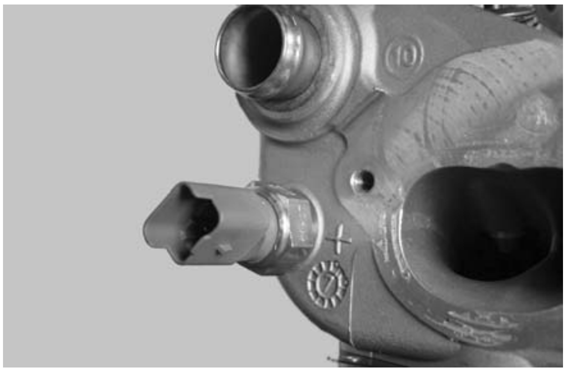
- Tighten the two internal screws on the head, timing system side, to the prescribed torque.

Locking torques (N*m)

Exhaust/ intake head fixing nuts 10 - 12



- Fit the coolant temperature sensor with the washer and tighten it to the prescribed torque.



CAUTION

FAILURE TO OBSERVE THE LOCKING TORQUE CAN DAMAGE THE SENSOR.

Locking torques (N*m)

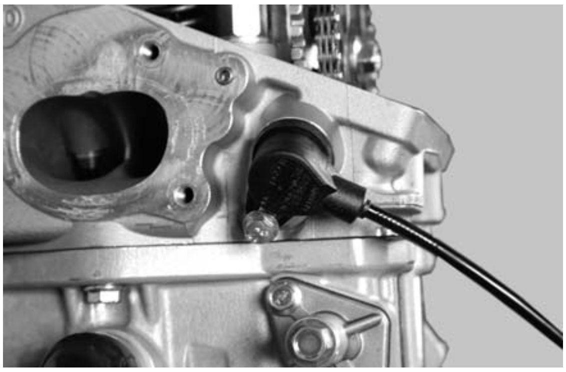
Coolant temperature sensor 21 ÷ 23

- Fit the spark plugs and tighten them to the prescribed torque.

Locking torques (N*m)

Spark plug 12 ÷ 14 Nm

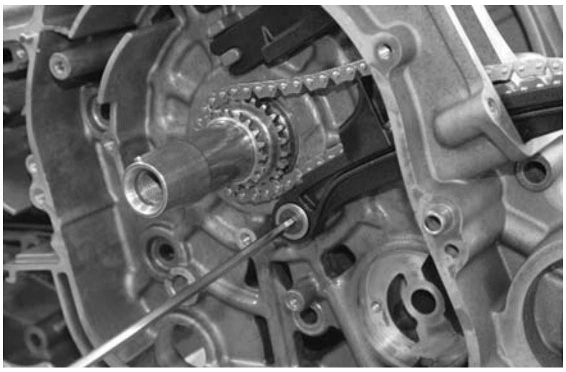
- Fit the rpm timing sensor and tighten to the prescribed timing.



Locking torques (N*m)

Rpm timing sensor screw 7.5 ÷ 8.5 Nm

- Fit the timing control chain on the crankshaft observing the initial direction of rotation.
- Fit the tensioner pad with the relevant spacer, tightening the fixing screw to the prescribed torque, using the recommended product.



Recommended products

Loctite 243 Medium strength threadlock

-

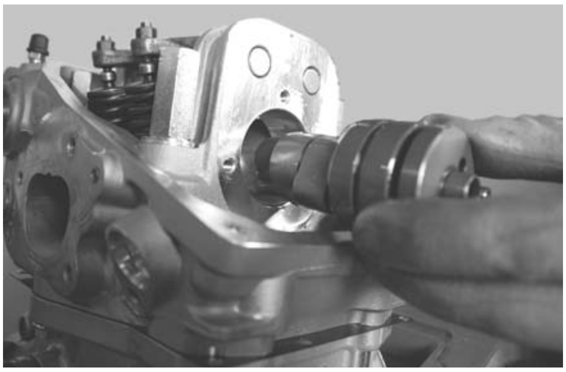
Locking torques (N*m)

Tensioner pad fixing screw 10 - 14

- Fit the pins and the rocking levers operating on the transmission side.
- Lubricate the 2 rocking levers through the holes at the top.



- Clean the camshaft by blowing short blasts of compressed air, especially the groove that holds the retaining plate.
- Lubricate the 2 bearings.
- Fit the camshaft in the cylinder head with the cams opposing the rocking levers.



- Remove any LOCTITE left on the screws fixing the camshaft retaining bracket using a brush.
- Apply the recommended product to the fixing screws and tighten them to the prescribed torque.

Recommended products

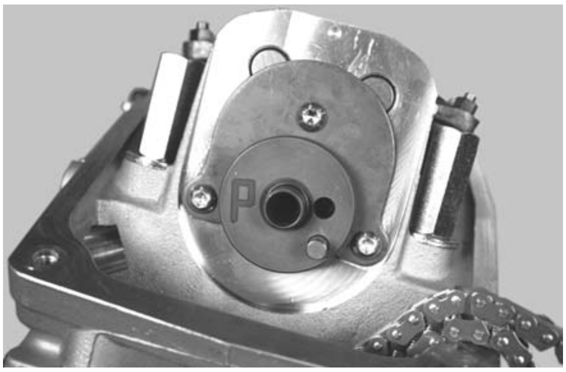
Loctite 243 Medium strength threadlock

-

- Insert the camshaft retaining bracket so that the countersinks are visible and tighten the 3 fixing screws to the prescribed torque, being careful not to damage the internal hexagon.

Locking torques (N*m)

Camshaft retaining bracket screws 4 ÷ 6

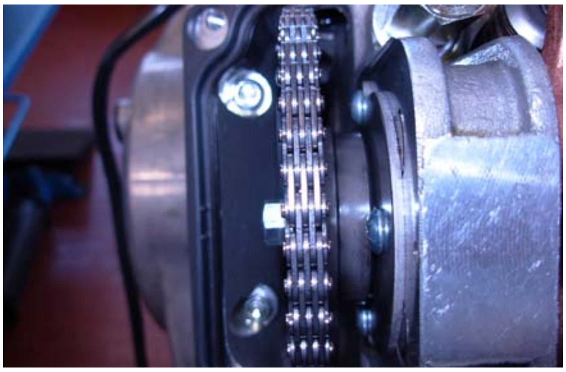


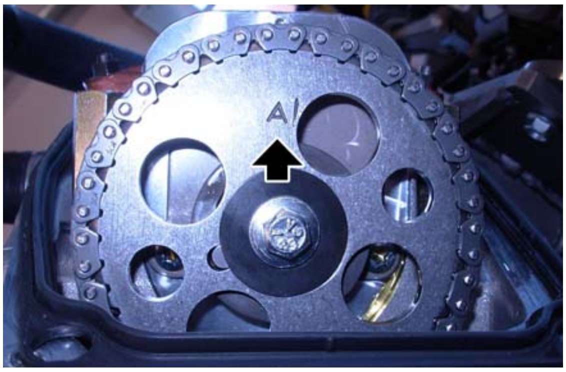
- Finish closing the flywheel side crankcase with the components following the instructions described

in the specific sections.

- Time following the instructions in the specific section.

- Fitting the head and the components of the front cylinder timing system vary if the spacer is fitted instead of the tone wheel and id the reference "A" instead of "P" is in the timing system gear.





Installing the head cover

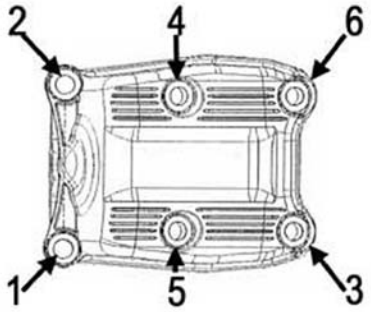
- Check that the gasket is in good condition.



- Tighten the two screws indicated in the figure with «**1**» and «**2**» to limit the reciprocal sliding of the cover surface with the head surface.
- Tighten the remaining 4 screws in a criss-crossed sequence (**3**,**4**,**5**,**6**).

NOTE

PAY ATTENTION TO THE CORRECT POSITION OF THE GASKET.

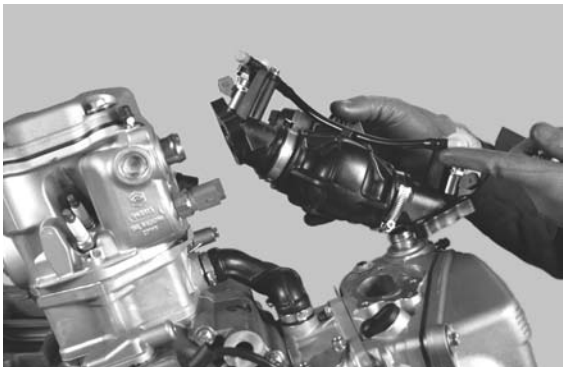


Locking torques (N*m)

Tappet cover fixing screws 7 - 9

Installing the intake manifold

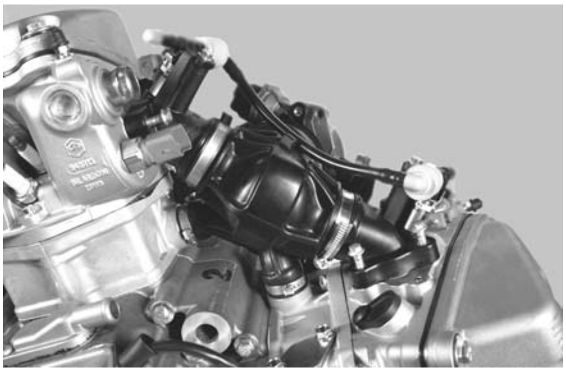
- Fit the inlet manifold in the engine.



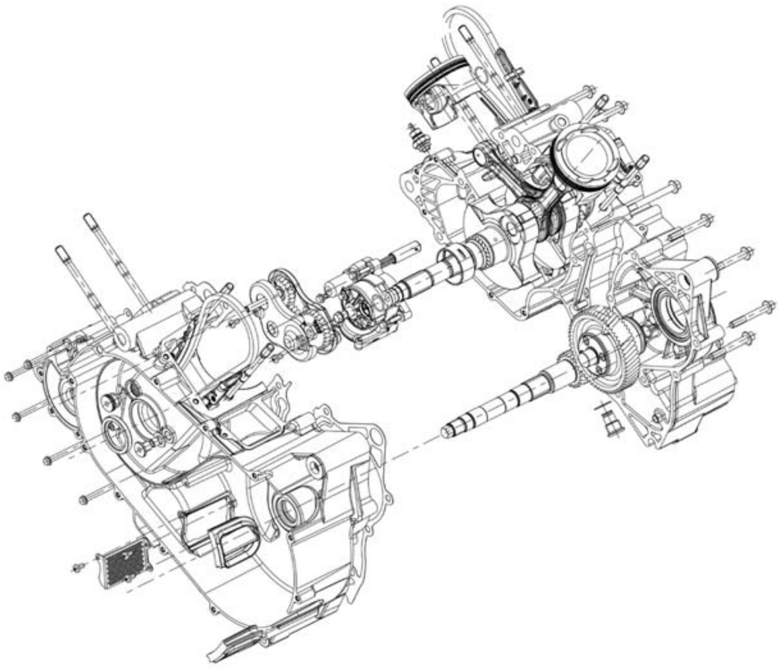
- Insert the six fixing screws and tighten them to the prescribed torque.

Locking torques (N*m)

Inlet manifold fixing screws 11 - 13



Crankcase - crankshaft



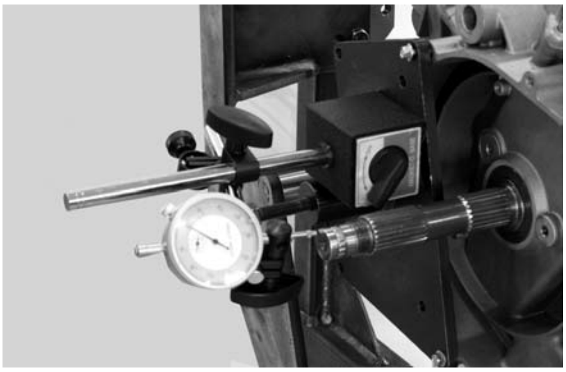
- Remove the transmission cover, the driving and the driven pulleys, as described in the «Automatic transmission» chapter.

- Remove the flywheel cover as described in the «Flywheel cover removal» chapter.

- Remove the magneto flywheel with the start-up control as described in the «Magneto flywheel removal» chapter.

- Remove the thermal parts (cylinders, heads, pistons) as described in the «Thermal group and Timing system» chapter.

- Before opening the engine crankcase, it is advisable to check the axial clearance of the crankshaft.



Specific tooling

020262Y Crankcase splitting strip

020335Y Dial gauge magnetic support

Characteristic

Standard clearance:

0.10 ÷ 0.50 mm

Increased limit after use:

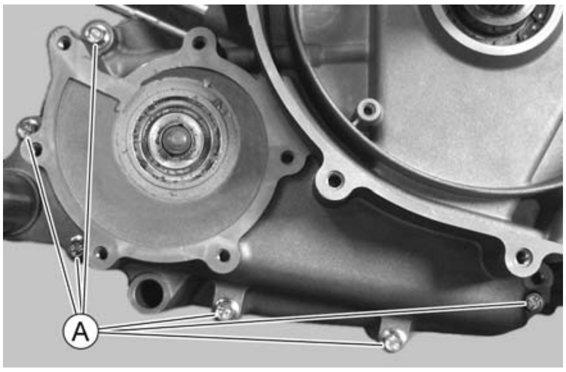
0.60 mm

- Higher clearances are signs of wear on the supporting surfaces of the crankshaft on the crankcase.
- To carry out an accurate measurement, measure the clearance in both directions between crank-

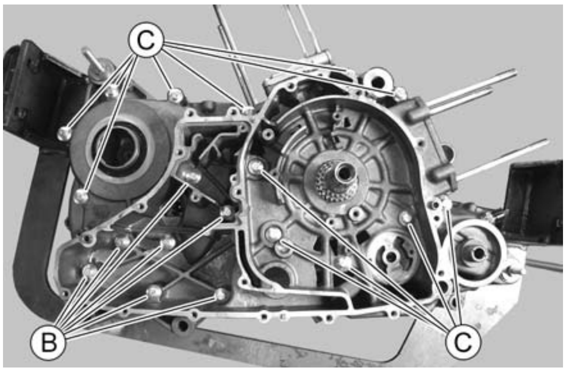
case and crankshaft.

Splitting the crankcase halves

- Working from the transmission side, unscrew the six screws «**A**» and collect the washers.



- Turn the support so as to operate on the flywheel side.
- Undo the three screws fixing it to the support, collect the washers and remove the three centring bushings.
- Undo the seven screws «**B**» and collect the copper washers.
- Undo the twelve screws «**C**» and collect the washers.



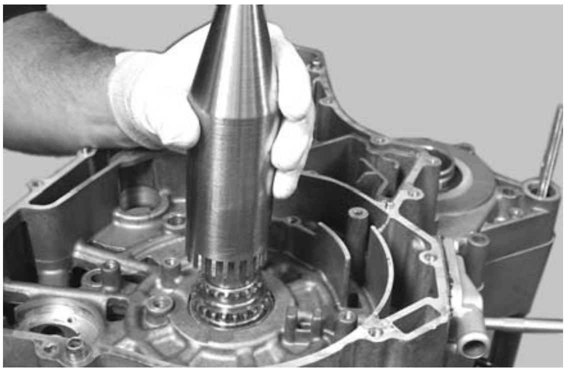
- Fit the specific tool on the flywheel side crankshaft, paying special attention that the tool matches the shaft perfectly.

CAUTION

FAILURE TO OBSERVE THIS RULE CAN DAMAGE THE MAIN BUSHINGS.

Specific tooling

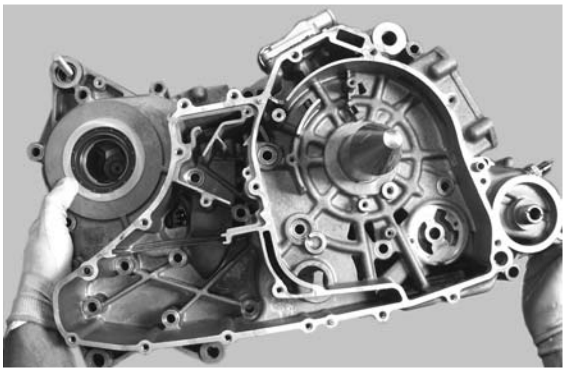
020664Y Flywheel side crankshaft fitting tip

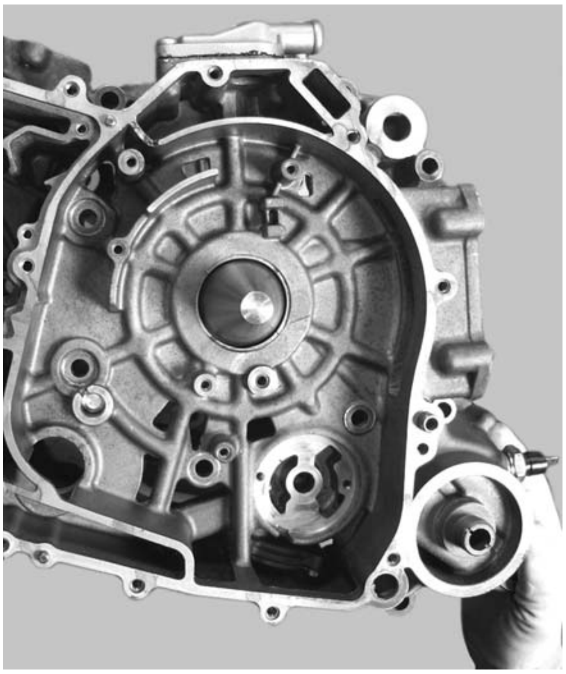


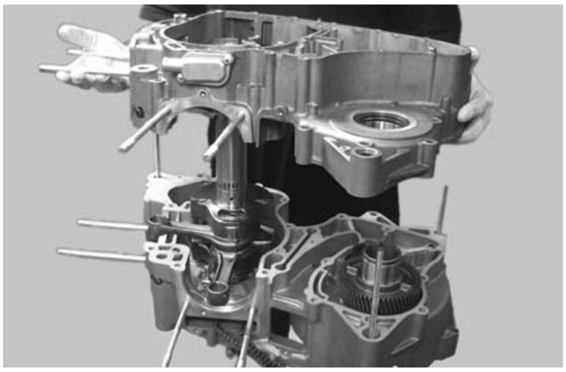


- Lubricate the external surface of the tip with petroleum jelly grease.

- Detach the crankcase half keeping the crankshaft connected to crankcase half on the transmission side.
- Remove the coupling gasket.



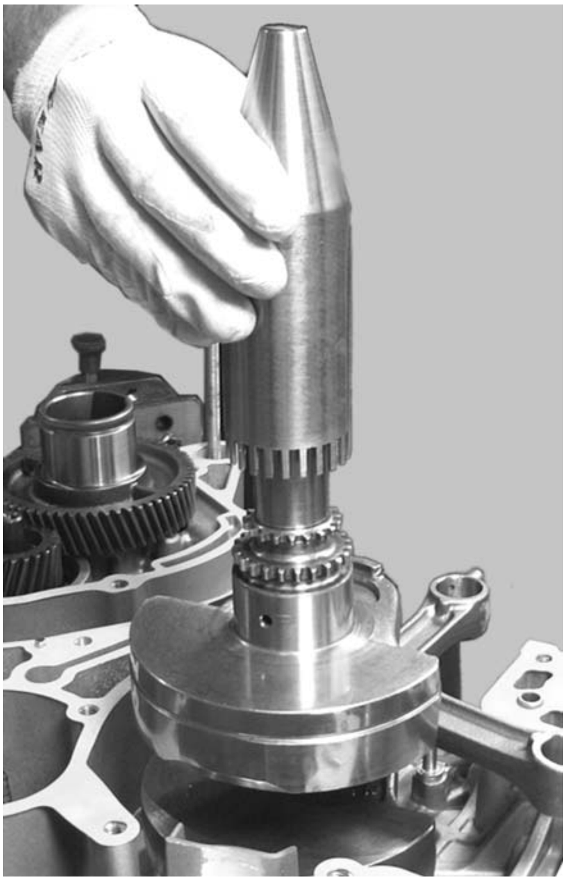




- Remove the tip.

Specific tooling

020664Y Flywheel side crankshaft fitting tip



Removing the crankshaft

- Fit the specific tool on the transmission side crankshaft, paying special attention that the tool matches the shaft perfectly.

CAUTION

DUE TO THE TIP WEIGHT PAY ATTENTION TO THE CORRECT COUPLING AND FALLING RISKS OF THE TOOL, ALWAYS HOLD IT WITH YOUR HANDS.



CAUTION

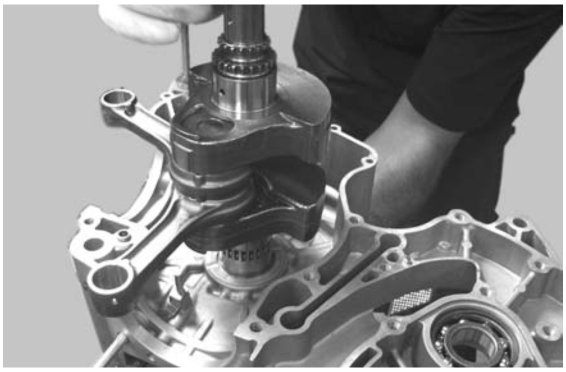
FAILURE TO OBSERVE THIS RULE CAN DAMAGE THE MAIN BUSHINGS.

Specific tooling

020665Y Transmission side crankshaft fitting tip

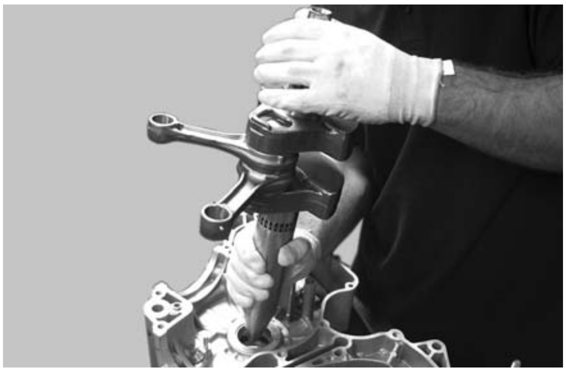
- Lubricate the external surface of the tip with petroleum jelly grease.

- Hold the tip with one hand and the crankshaft with the other, pull the crankshaft upwards.





- Pull out the tip from the bushings, remove the crankshaft.



- Once the crankshaft has been removed it is possible to remove the timing chain on the transmission side.

Inspecting the crankcase halves

- Before checking the crankcase halves, thoroughly clean all the surfaces and oil pipes.

- Clean the jets and contacts carefully.

NOTE

THE JET IS FED THROUGH THE MAIN BUSHINGS. PROPER OPERATION OF THIS COMPONENT IMPROVES PISTON CROWN COOLING. CLOGGING HAS EFFECTS THAT ARE DIFFICULT TO DETECT (PISTON TEMPERATURE INCREASE). FAILURE OR LEAKAGE CAN CONSIDERABLY CAUSE A DROP IN LUBRICATION PRESSURE FOR THE MAIN BUSHINGS AND CONNECTING ROD.

NOTE

AS ALREADY DESCRIBED IN THE LUBRICATION CHAPTER, IT IS ESPECIALLY IMPORTANT THAT THE BY-PASS VALVE HOUSING SHOWS NO WEAR THAT MAY IMPAIR THE PROPER SEALING OF THE LUBRICATION PRESSURE ADJUSTMENT PISTON. THE HEAD LUBRICATION CHANNEL IS FITTED WITH A SHUTTER JET; THIS GIVES A "LOW PRESSURE" HEAD LUBRICATION. THIS CHOICE HAS BEEN MADE TO REDUCE THE OIL TEMPERATURE IN THE SUMP.

Jet clogging impairs head lubrication and the timing mechanisms.

A jet failure causes a drop in lubrication pressure for the main bushings and connecting rod.

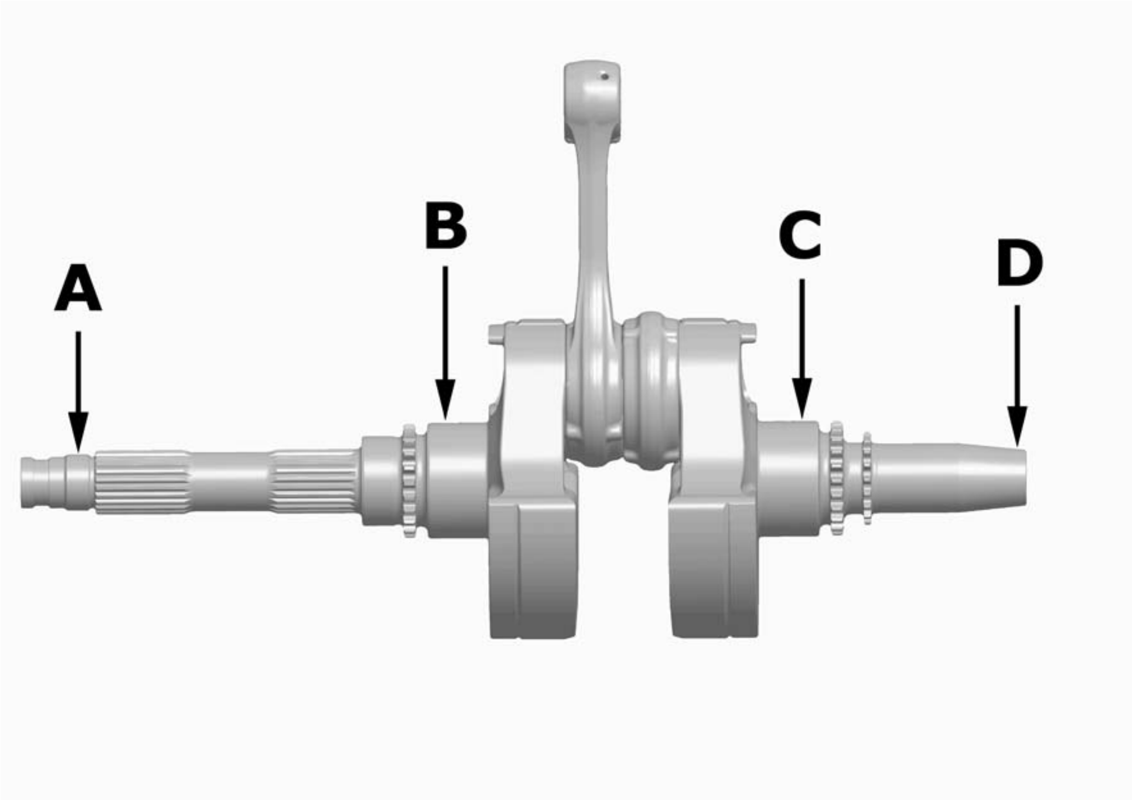
- Check the coupling surfaces for scratches or deformation, paying special attention to the cylinder - crankcase surfaces and the crankcase halves coupling surfaces.
- Defects in the crankcase coupling gasket or the surfaces can cause a drop in the oil pressure and affect the lubricating pressure.
- Check that the surfaces limiting the crankshaft axial clearance show no signs of wear. To measure and check sizes follow the procedure described previously for checking crankshaft axial clearance and dimensions

Inspecting the crankshaft components

Crankshaft alignment

Specific tooling

020335Y Dial gauge magnetic support

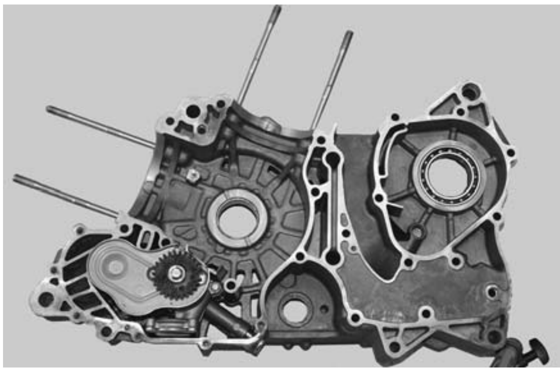


MAXIMUM OFF-LINE ALLOWED

Specification	Desc./Quantity
A =	0.15 mm
B =	0.010 mm
C =	0.010 mm
D =	0.10 mm

Inspecting the crankshaft plain bearings

- In order to obtain proper bushing lubrication, make sure there are both an outstanding lubrication pressure (4,5 bar) and a good oil flow rate. To that end, the bushings must be correctly positioned so as not to obstruct the oil supply channels.
- The main bushings are comprised of 2 half-bearings, one with holes and channels for lubrication while the other is solid.



- The solid half-bearing is intended to stand the thrusts caused by combustion, and for this reason, it

is arranged opposed to the cylinder.

- So as not to obstruct the oil supply channels, the coupling surface of the two half-bearings must be perpendicular to the cylinder axis as shown in the figure.
- The oil supplying channel section is also influenced by the depth to which the bushings are driven compared with the crankshaft axial clearance of the limiting surface.

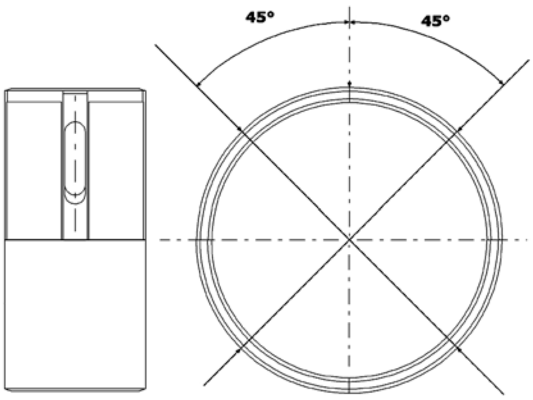
NOTE

TO KEEP THIS POSITION OF THE BUSHINGS ON THE CRANKCASE, FITTING IS FORCED ON CAST IRON RINGS INSERTED IN THE CASTING OF CRANKCASE HALVES.

- Measure the bushings diameter at the 3 positions indicated in the figure.
- Repeat the measurements for the other half of the bushing. See figure.

NOTE

DO NOT TAKE THE MEASUREMENT ON THE TWO HALF-SHELLS COUPLING SURFACE SINCE THE ENDS ARE RELIEVED TO ALLOW BENDING DURING THE DRIVING OPERATION.



Before fitting, check that the clearance between the engine crankcase bushing and the crankshaft is within the predetermined limits.

Characteristic

Crankshaft-bushing maximum clearance allowed:

0.08 mm

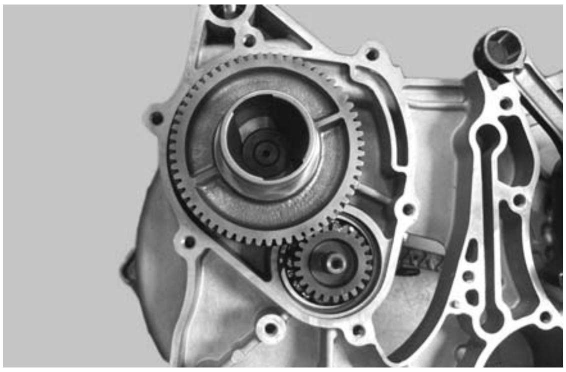
- The standard bushing diameter after driving varies according to a coupling selection.
- The bushing seats in the crankcase are classified into 2 categories - Cat 1 and Cat 2 - just like those for the crankshaft
- Bushings are subdivided into 3 categories according to their thickness. (See chart on the "Specifications" chapter)

See also

Crankcase - crankshaft - connecting rod

Installing the crankshaft

- Fit the driven pulley shaft and the universal joint axle.



- Fit the specific tool on the transmission side crankshaft, paying special attention that the tool matches the shaft perfectly.

CAUTION

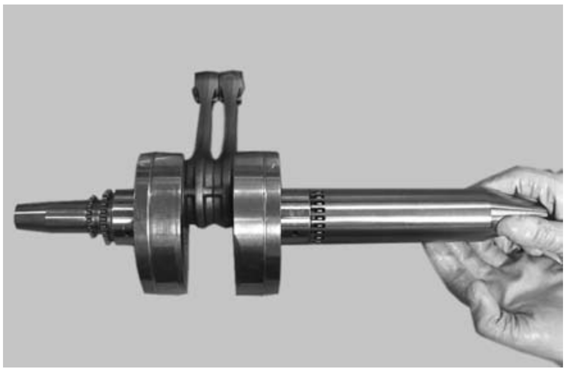
FAILURE TO OBSERVE THIS RULE CAN DAMAGE THE MAIN BUSHINGS.

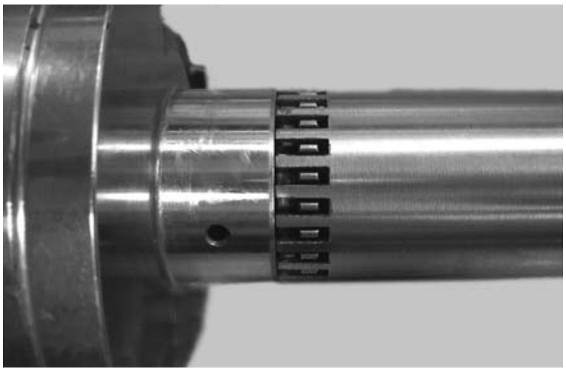
CAUTION

DUE TO THE TIP WEIGHT PAY ATTENTION TO THE CORRECT COUPLING AND FALLING RISKS OF THE TOOL, ALWAYS HOLD IT WITH YOUR HANDS.

Specific tooling

020665Y Transmission side crankshaft fitting tip





- Lubricate the external surface of the tip with petroleum jelly grease.

NOTE

LUBRICATE THE BUSHINGS WITH ENGINE OIL BEFORE FITTING THE CRANKSHAFT.

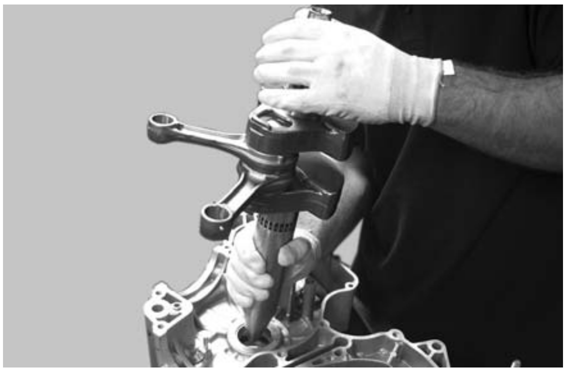
CAUTION

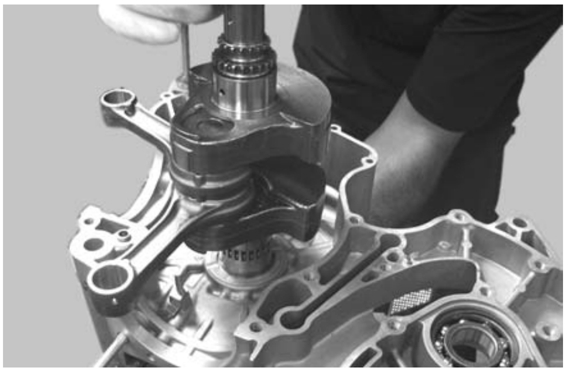
FIT THE TRANSMISSION SIDE TIMING CHAIN.
FIT THE DRIVE CHAIN BEFORE THE CRANKSHAFT.

- Fit the crankshaft with the driving pulley axle inside the transmission side crankcase halves.

NOTE

PLACE THE CONNECTING RODS CORRECTLY.





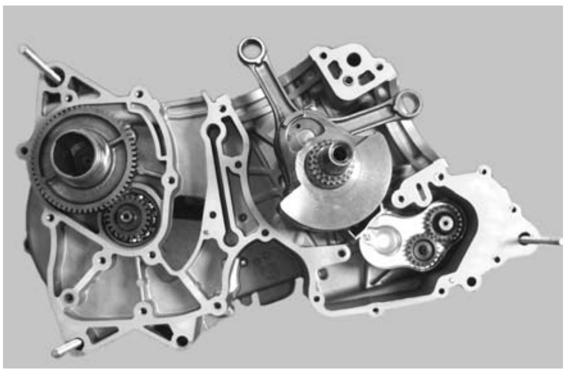
- At the same time, hold with one hand the crankshaft and with the other the tip until the crankshaft stops on the crankcase half.
- Remove the tip.



Specific tooling

020665Y Transmission side crankshaft fitting tip

- Place the coupling gasket.



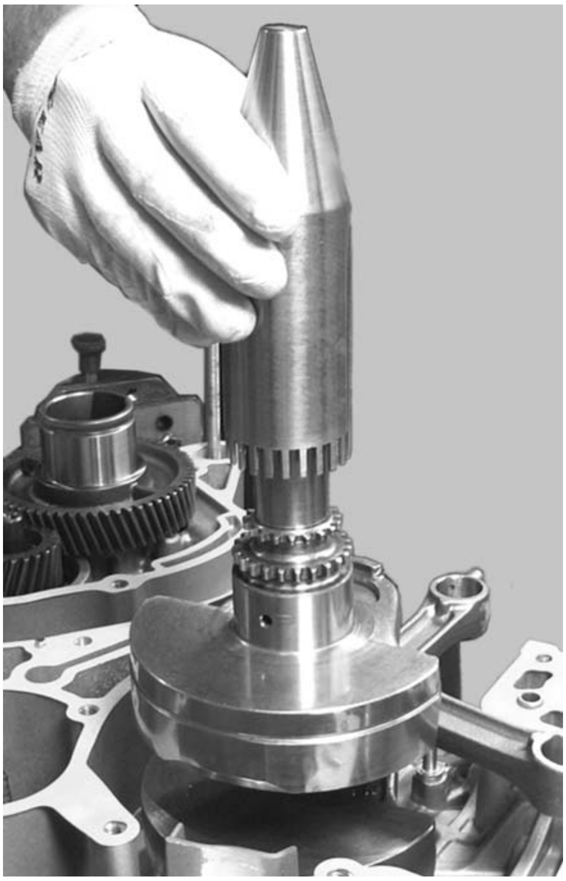
- Fit the specific tool on the flywheel side crankshaft, paying special attention that the tool matches the shaft perfectly.

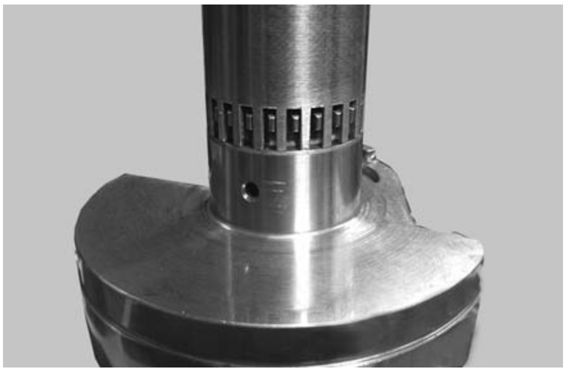
CAUTION

FAILURE TO OBSERVE THIS RULE CAN DAMAGE THE MAIN BUSHINGS.

Specific tooling

020664Y Flywheel side crankshaft fitting tip



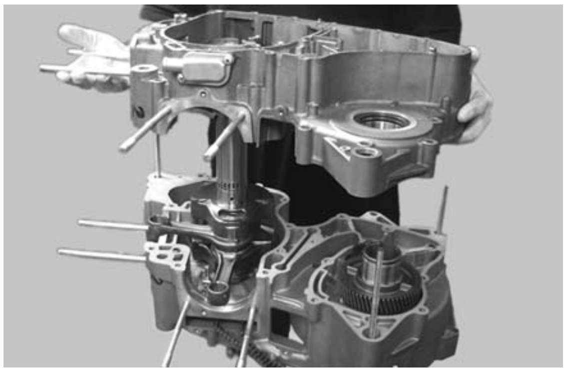


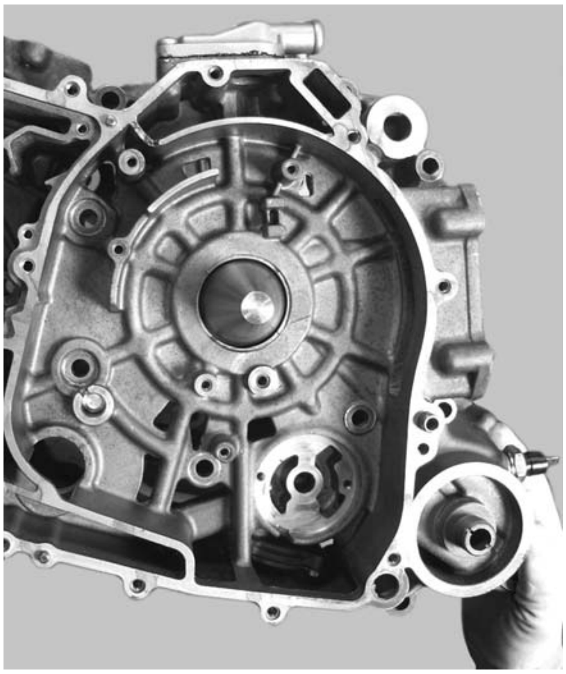
- Lubricate the external surface of the tip with petroleum jelly grease.

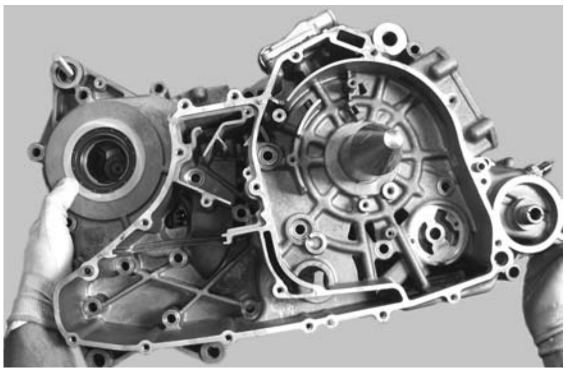
NOTE

LUBRICATE THE BUSHINGS WITH ENGINE OIL BEFORE FITTING THE CRANKSHAFT.

- Pay attention and fit the flywheel side crankcase half until there is a complete coupling.



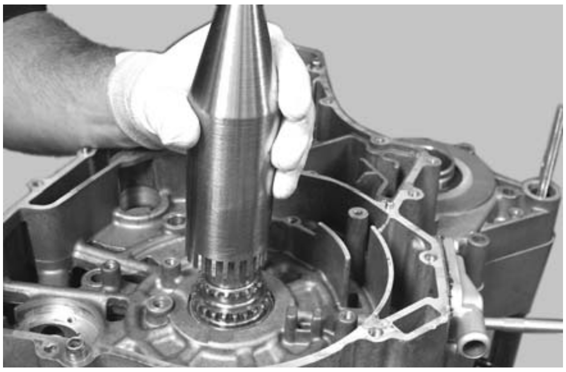




- Remove the tip.

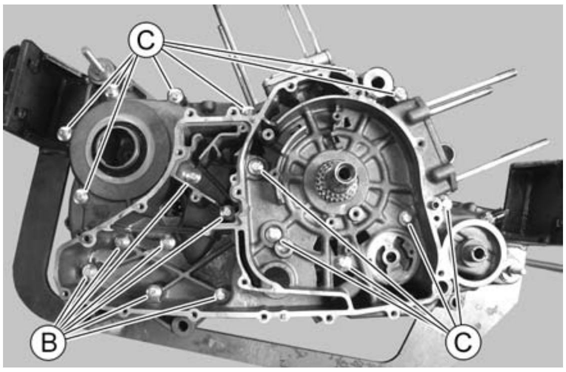
Specific tooling

020664Y Flywheel side crankshaft fitting tip



Refitting the crankcase halves

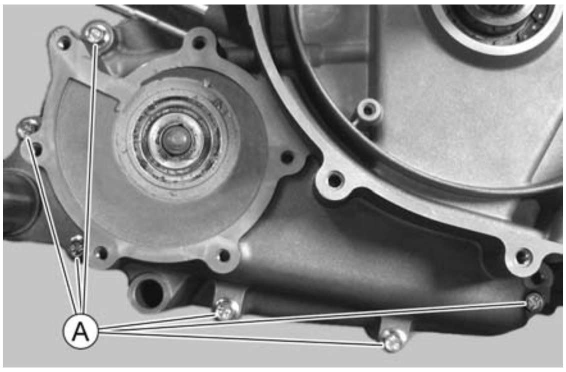
- Tighten the seven screws «**B**» with the copper washers as far as they will go.
- Tighten the twelve screws «**C**» with the washers as far as they will go.
- Tighten to the prescribed torque.



Locking torques (N*m)

Crankcase-engine coupling screws (M8) 25 ÷ 28

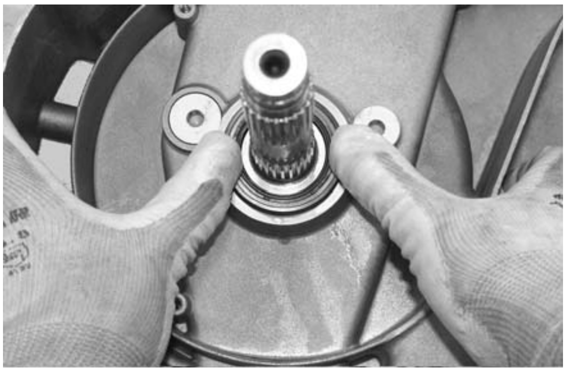
- Fit the centring bushings, the washers and screw the fixing nuts to the support.
- Turn the support so as to operate on the transmission side.
- Screw the six screws «**A**» with the washers and tighten to the prescribed torque.



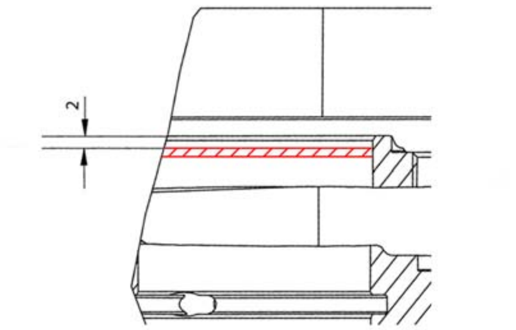
Locking torques (N*m)

Crankcase-engine coupling screws (M6) 11 ÷ 13

- Fit a new oil seal in the transmission side crankcase half on the driving pulley axle.
- Fit the oil seal manually being careful that the internal lips are correctly placed on the crankshaft.

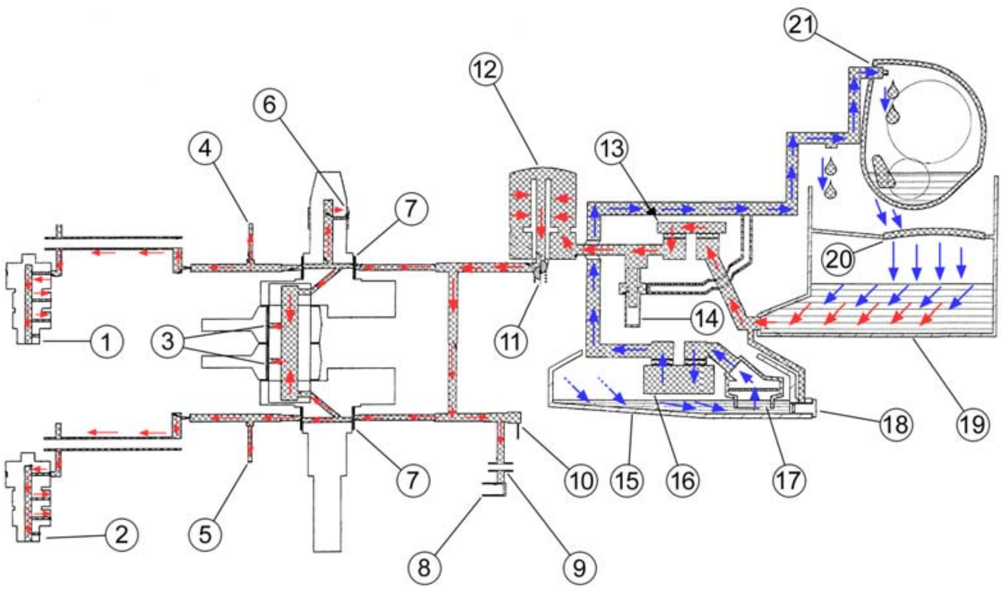


- With a pipe of the indicated size, inside Ø XX,X mm - outside Ø XX,X mm, set the oil seal at the indicated distance, check with the gauge, according to the indications described in the figure.



Lubrication

Conceptual diagrams



LUBRICATION CIRCUIT

Specification	Desc./Quantity
1	FRONT HEAD CAMSHAFTS
2	REAR HEAD CAMSHAFTS
3	CONNECTING ROD BUSHINGS
4	FRONT PISTON LUBRICATION JET
5	REAR PISTON LUBRICATION JET
6	STARTING RING GEAR BUSHING LUBRICATION
7	CRANKSHAFT BUSHINGS
8	WATER PUMP CONTROL TRANSMISSION GEAR SHAFT LUBRICATION
9	WATER PUMP SHAFT LUBRICATION
10	MINIMUM OIL PRESSURE SENSOR
11	NON-RETURN VALVE
12	OIL CARTRIDGE FILTER
14	BY-PASS VALVE
13	OIL DELIVERY PUMP
16	RECOVERY OIL PUMP
15	FILLER NECK OIL
17	SUCTION ROSE
18	OIL DRAINAGE PLUG
19	OIL TANK
20	OIL TANK FILTER
21	OIL PASSAGE FROM THE HUB TO THE TANK

The RED arrows indicate the oil delivery circuit. The BLUE arrows indicate the oil recovery circuit.

General characteristics

The lubrication system is divided into two sections:

- **high pressure**

- **low pressure**

The high pressure section includes all components located on the engine crankcase; while the low pressure section only refers to the thermal group.

The trochoidal pump is fitted into the sump and controlled through the chain.

To guarantee the integrity of the pump, a pre-filter is fitted.

Pump delivery is controlled by means of a piston by-pass calibrated to 4.5 bar. This piston is located

upline the cartridge filter.
The by-pass located upline the cartridge filter improves the operating conditions for the filter, particularly with cold oil.
The filter is equipped with an anti-drain valve and a pressure relief valve; the latter intervenes when the filtering element causes a pressure drop exceeding 1 ± 0.2 bar.
These conditions naturally occur only with cold oil and at high running engine or if the filter is dirty.
The filtered oil is used to lubricate the water pump shaft and the transmission shaft, to lubricate the main bearings, the connecting rod head and the piston cooling nozzle, located on the transmission side bearing.
The main bearing on the transmission side is fitted with an oil seal and the respective drain line.
The supply line for the timing system comes from the flywheel-side bearing; delivery to the head is controlled by the respective jet screwed in the engine crankcase, in the same way the supply line of the timing system to the rear cylinder comes from the transmission.
The components of the timing system work with low-pressure oil.
The camshaft bearings are marked directly on the aluminium of the head; the camshaft axial clearance is partially compensated by the oil supplied to the smaller diameter bearing.
The camshaft supplies the lubricant to the rocking levers via the bores provided; these are installed in a position so as to ensure that the lubrication is maintained even after the vehicle has stopped. This is achieved when the camshaft reaches its most usual and likely position when the engine is switched off.
The oil used to lubricate the head returns to the sump via the chain casing channel and therefore it also provides lubrication for the chain.
In order to avoid that the gas collected from the crankcase carries oil, a one-way valve and a decantation chamber are used. The one-way valve is a metal reed valve; the decantation chamber has a drainage hole. A failure in these components implies oil getting into the line supplying air to the engine.
Excessive oil vapours may result in the clogging of ducts on the throttle body.
In order to signal low oil pressure in the system, a pressure switch is used, located immediately after the oil filter outlet.
The lubrication circuit does not include the piston or the pin, also in this case the cooling nozzle is particularly important.

Diagnosis guide

1 - Minimum oil pressure warning light on with hot engine.

CONTINUE - point 2

2 - Remove the electric connector of the minimum pressure switch.

Check that the warning light turns off.

YES - point 3 NO point 11

3 - Check the actual oil pressure.

CONTINUE - point 4

4 - Remove the switch and fit the specific tool with the relevant gasket.

Specific tooling

020193Y Gauge for oil pressure check

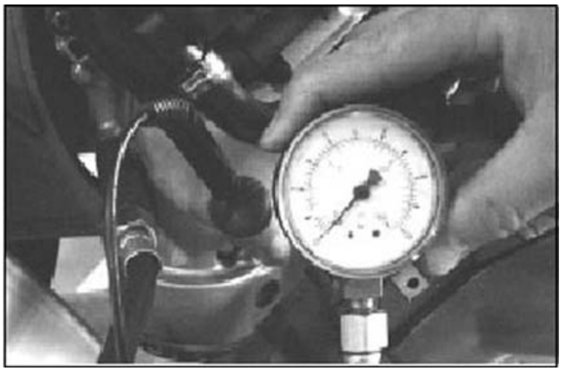
020434Y Fitting for oil pressure check

- Remove the dipstick with the oil filler plug and insert a plug with the temperature probe supplied with the specific tool. Insert the probe to feel contact with the crankcase bottom and pull back a few millimetres.

Specific tooling

020331Y Digital multimeter

CONTINUE - point 5



5 - Measure pressure with cold and idling engine.

STANDARD VALUES

Specification	Desc./Quantity
20°C Temperature	
1400 rpm	

~ 4.5 bar

Specific tooling

020460Y Scooter tester and diagnosis

YES - point 6 NO point 12

6 - Let the engine warm up and repeat the check with hot oil.

STANDARD VALUES

Specification	Desc./Quantity
80°C Temperature	
1400 rpm	

~ 1.5 bar

YES - point 7 NO point 8

7 - Replace the minimum oil pressure.

8 - If pressure lower than 1.3 ÷ 1.5 bar is measured.

CONTINUE - point 9

9 - Replace the oil filter and repeat the pressure check with oil at 80°C.

YES - point 10 NO point 13

10 - The failure is fixed.

It is recommended to observe the suggested number of kilometres covered.

11 - Check and restore the electrical system.

12 - If pressure lower than 4 bar is measured.

CONTINUE - point 9

13 - Open the engine crankcase and check the by-pass efficiency.

YES - point 14 NO point 15

14 - Check whether there is an irregular clearance on the crankshaft:

- axial clearance (see the "Crankcase and Crankshaft" chapter)

- radial clearance, especially in the direction of the cylinder axis

- clearance according to the direction of rotation with the connecting rod in quadrature

YES - point 16 NO point 17

15 - Replace damaged components.

16 - Overhaul the engine.

17 - Open the engine crankcase and remove the oil pump, as described in the "Crankcase and Crankshaft" chapter.

- Check the oil pump as described in the following pages.

- Check that the cooling nozzle and the timing system supply jet are properly fitted.

- Visually inspect the crankshaft couplings and their size «Specifications Chapter».

NOTE

ANY FAILURES IN THE COUPLINGS AND IN THE TIMING COMPONENTS CANNOT BE DETECTED BY THE LUBRICATION PRESSURE CHECK. THE FAILURES MAY BECOME EVIDENT BY AN INCREASE OF NOISE.

NOTE

IN CASE OF IRREGULAR PRESSURE ON THE BASE, CARRY OUT A VISUAL

AND DIMENSIONAL INSPECTION OF THE TIMING COMPONENTS (SEE THERMAL GROUP AND TIMING SYSTEM CHAPTER).

Oil pressure check

1 - In case of oil or oil filter leaks, check the lubrication pressure.

CONTINUE point 2

2 - Fit the specific tool.

Specific tooling

020193Y Gauge for oil pressure check

020434Y Fitting for oil pressure check

CONTINUE - point 3

3 - Check the system pressure with cold engine and medium - high speed.

Standard pressure < 6 bar

YES point 4 NO point 5

4 - Replace the damaged components.

5 - Check the adjustment by-pass efficiency and restore the proper sliding.

NOTE

STANDARD PRESSURES ARE OBTAINED USING OIL WITH THE PRESCRIBED VISCOSITY. A HIGHER VISCOSITY CAUSES AN INCREASE OF THE SYSTEM PRESSURE.

1 - If oil consumption is higher than 250 gr/1000 km on run-in engine, proceed as follows.

CONTINUE point 2

2 - Check the presence of oil at the recovery duct on the filter housing.

YES - point 3 NO point 4

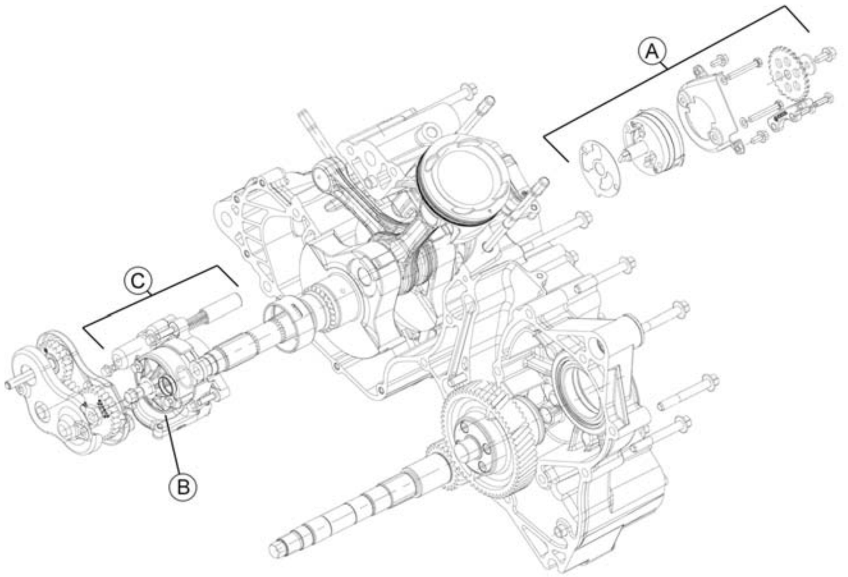
3 - Check the efficiency of the one-way reed valve and the decantation chamber drainage hole.

YES - point 5 NO point 4

4 - Check the thermal group seals (piston rings, valve guides and oil seals), see the "Thermal group and Timing system" chapter.

5 - Restore the valve or the drainage hole efficiency.

Oil pump



KEY:

A. Delivery pump

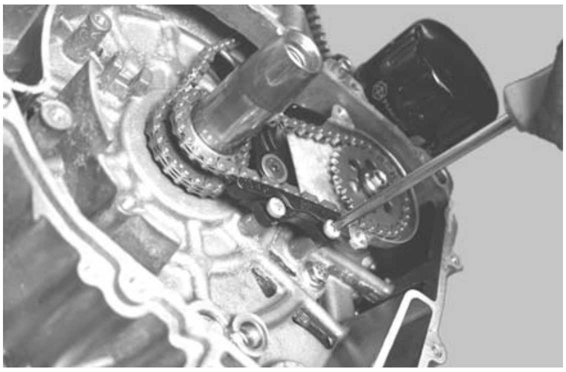
B. Recovery pump

C. By-pass

Removing

- The lubrication system includes the delivery and recovery pump.
- To operate on the delivery pump, remove the casing of the oil anti-backflow plate under the flywheel.
- To operate on the recovery pump, open the crankcase, and operate inside the crankcase half on the flywheel side.

- Operating from the outside undo the chain tensioner slider fixing screws.
- Remove the chain tensioner slider.



- Lock with the specific tool, undo the fixing screw

and collect the washer.

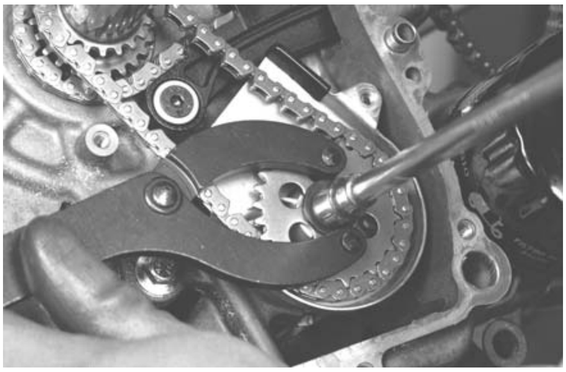
- Remove the oil pump control crown.

NOTE

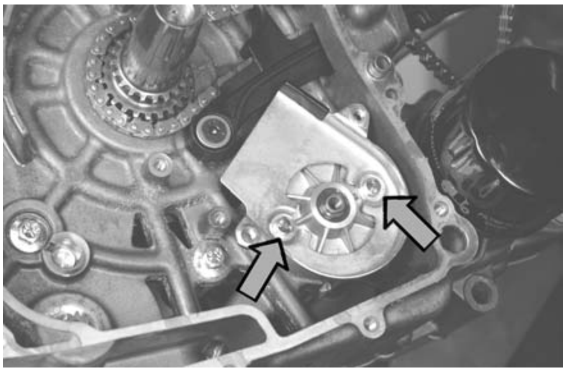
IT IS ADVISABLE TO MARK THE CHAIN IN ORDER TO ENSURE THAT THE INITIAL DIRECTION OF ROTATION IS MAINTAINED

Specific tooling

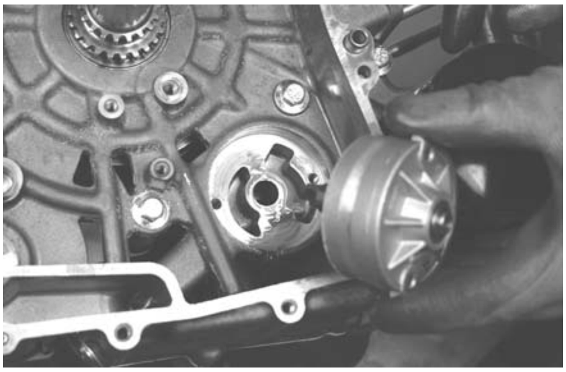
8106702 Clutch bell calliper spanner



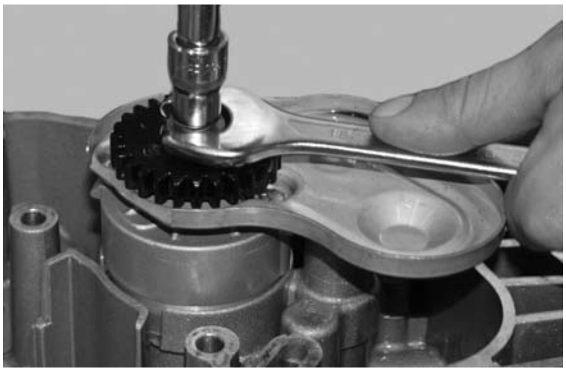
- Unscrew the two fixing screws and remove the crankcase protecting the oil pump.



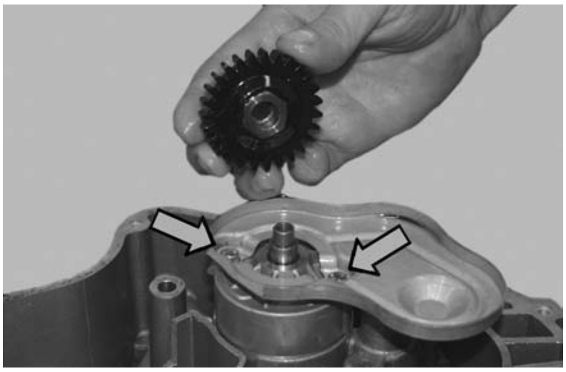
- Remove the delivery oil pump with the gasket.



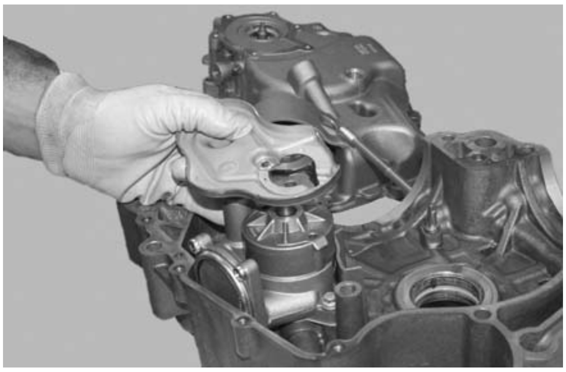
- Operating from inside:
- Lock the recovery oil pump axle, undo the fixing screw and collect the washer.



- Remove the water pump control gear, undo the two indicated screws and collect the washers.



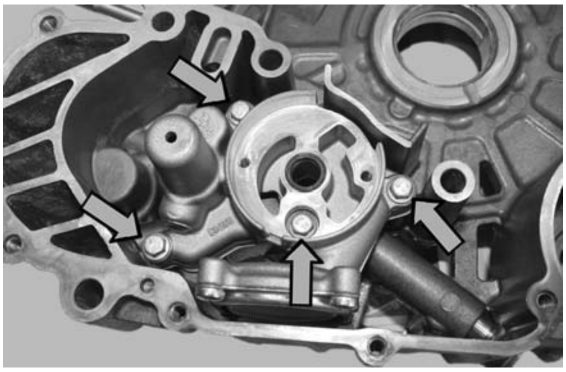
- Remove the oil anti-backflow plate.



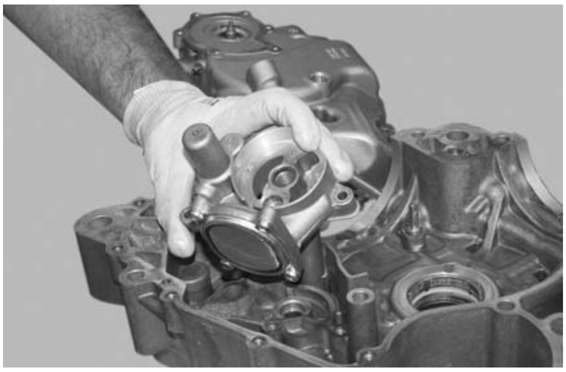
- Remove the oil pump and the relevant gasket.



- Undo the four indicated screws.

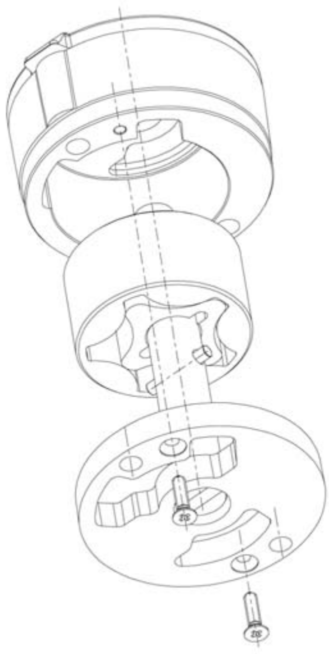


- Remove the by-pass recovery duct with the gasket.



Inspection

- The procedure is described only once but it is valid for both pumps.



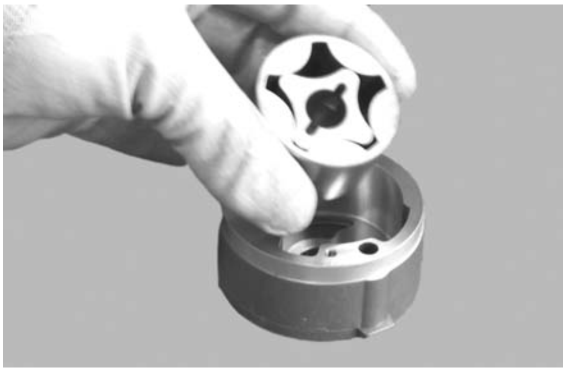
- Undo the two screws and remove the oil pump cover.





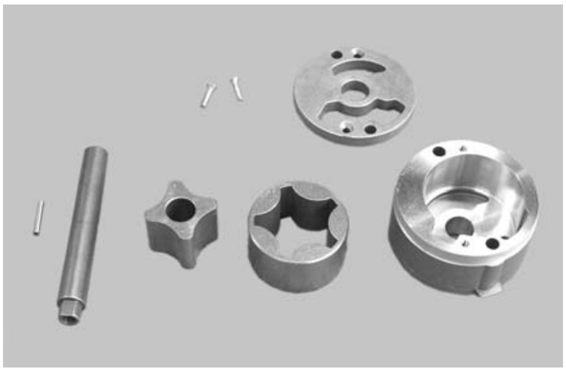
- Slide off the shaft with the rotor driving pin.
- Remove the two rotors and wash them thoroughly.





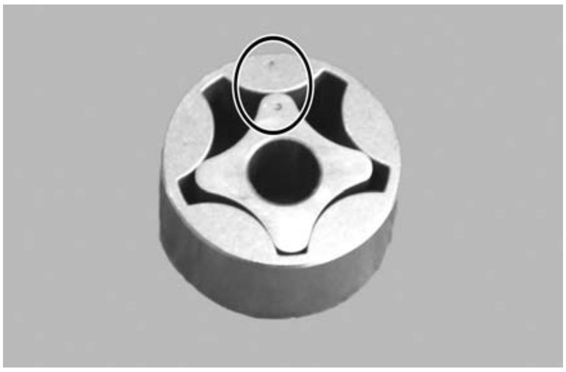
NOTE

VISUALLY INSPECT THAT ALL THE COMPONENTS ARE IN GOOD CONDITIONS. THERE MUST BE NO SIGNS OF WEAR OR SLIPPAGE. IN CASE OF THERE ARE EVIDENT TRACES OF WEAR, REPLACE THE COMPONENTS.



- Once checked if the components are in good conditions, assemble the pump and check the size.

- Assemble the two rotors, and align them following the reference marks.



- Fit the assembled rotors inside the pump body, with the reference marks facing the inside.



CAUTION

ONCE THE ROTORS ARE FITTED INSIDE THE PUMP BODY, THE REFERENCE MARKS ON THEM MUST NOT BE VISIBLE.



- Measure distance between rotors with a thickness gauge at the indicated position.

Characteristic

Standard clearance:

0.04 - 0.1 mm



- Measure the distance between the outer rotor and the pump body (see figure).

Characteristic

Standard clearance:

0.05 - 0.12 mm



- Check the levelness of the two rotor surfaces and the pump body with a trued bar as an abutment plane as indicated in the figure.



CAUTION

FAILURE TO OBSERVE THESE RULES CAN CAUSE SERIOUS DAMAGE TO THE ENGINE. IF THE VALUES ARE NOT WITHIN THE PRESCRIBED LIMITS, REPLACE THE COMPONENTS.

Characteristic

Limit value allowed:

0.1 mm

- Check all the conditions indicated above, fit the plug and tighten the fixing screws to the prescribed torque.



Locking torques (N*m)

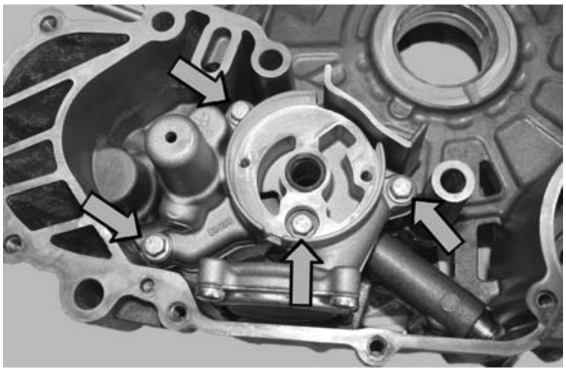
Cover screws 0.7 ÷ 0.9 Nm

Installing

- Operating from inside the flywheel side crankcase half:
- Fit the by-pass recovery duct, with the gasket and tighten the four fixing screws to the prescribed torque.

Locking torques (N*m)

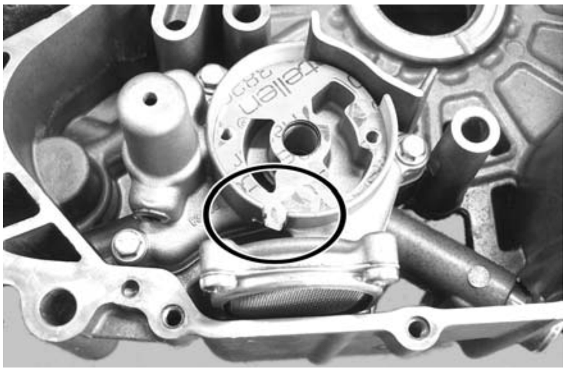
By-pass scavenge pipe fixing screws 11 - 13



- Make sure the gasket is in the correct position.

NOTE

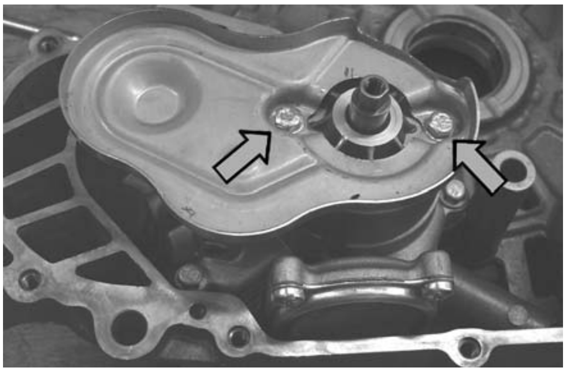
THE TOOTH OF THE GASKET MUST BE IN ITS SEAT.



- Fit the oil recovery pump and the oil anti-backflow plate.
- Tighten the two indicate screws to the prescribed torque.

Locking torques (N*m)

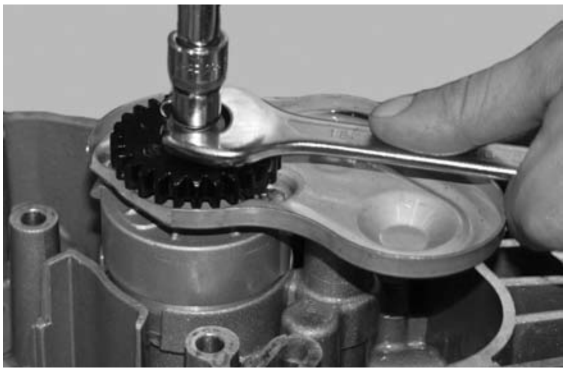
Screws fixing oil pump to crankcase 5 ÷ 6



- Fit the water pump control gear on the oil pump shaft.
- Tighten the locking screw with the washer and tighten to the prescribed torque.

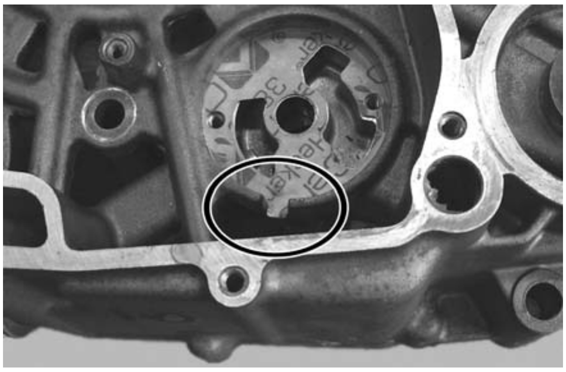
Locking torques (N*m)

Water pump gear fixing screws 5 ÷ 6



- Once the recovery oil pump fitting is finished, operate from outside the flywheel side crankcase half.

- Make sure the gasket is in the correct position.



NOTE

THE TOOTH OF THE GASKET MUST BE IN ITS SEAT.

- Fit the timing chain and the timing chain tensioner slider.
- Tighten the fixing screw to the prescribed torque.

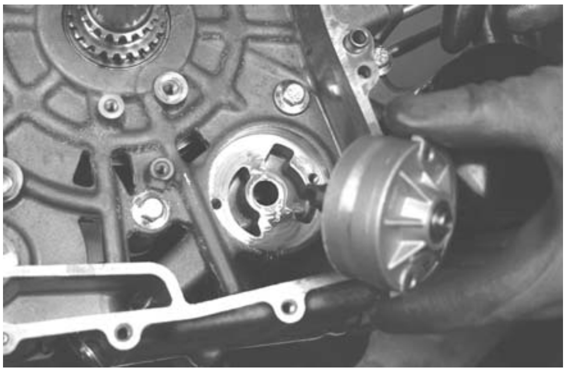


Locking torques (N*m)

Tensioner pad fixing screw 10 - 14

- Fit the delivery oil pump.

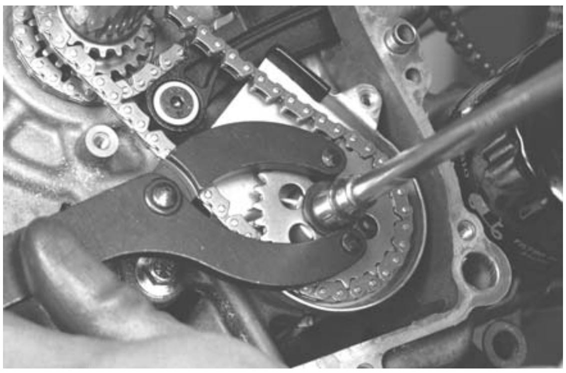
- Fit the crankcase protecting the oil pump and tighten the two screws to the prescribed torque.



Locking torques (N*m)

Screws fixing oil pump to crankcase 5 ÷ 6

- Fit the oil pump control crown and the driving chain.
- Screw the fixing screw with the belleville washer, with the specific tool and tighten to the prescribed torque.



CAUTION

PLACE THE BELLEVILLE WASHER WITH THE CONVEX PART FACING THE OIL PUMP CONTROL CROWN.

Specific tooling

8106702 Clutch bell calliper spanner

Locking torques (N*m)

Oil pump crown gear screw 10 ÷ 14

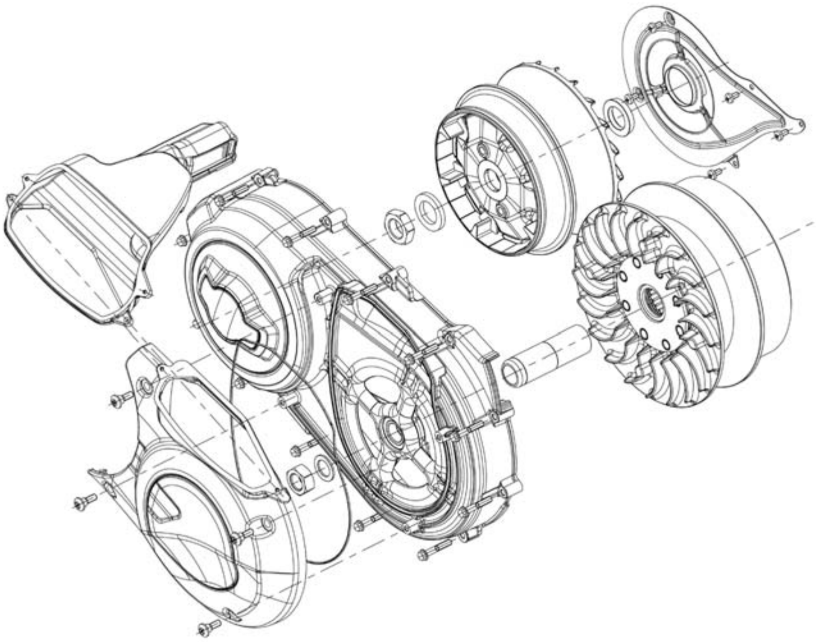
- Fit the tensioner pad and tighten the two screws to the prescribed torque.



Locking torques (N*m)

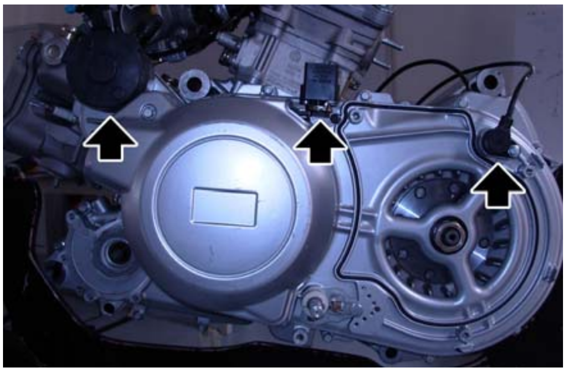
Chain tensioner slider - oil pump 2 ÷ 3

Automatic transmission

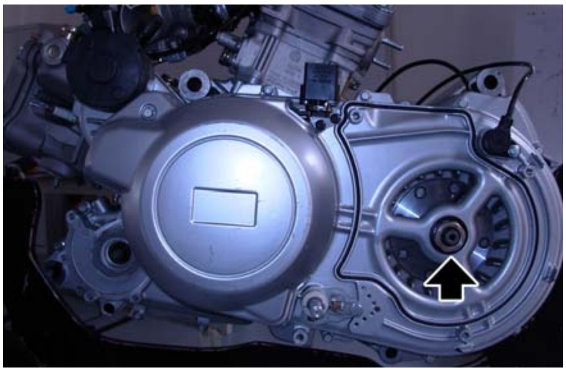


Transmission cover

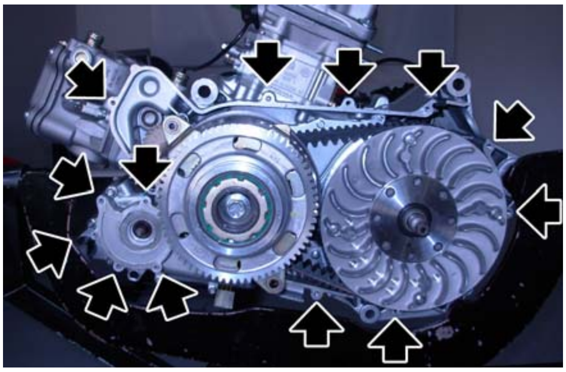
- Remove the variator motor, the driven pulley revolution sensor and the rotation position sensor.



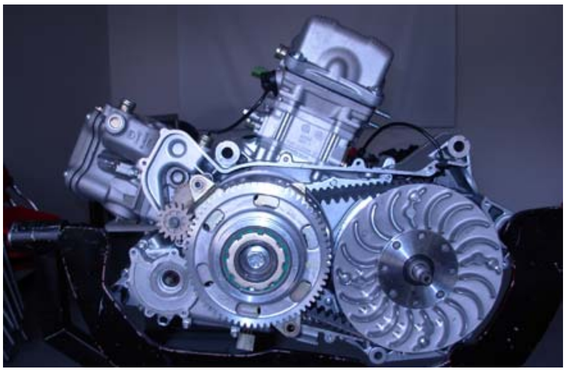
- Loosen the driven pulley shaft fixing nut with a misaligned wrench and prevent the pulley shaft rotation using a hexagon box-spanner.



- Undo the thirteen screws fixing it to the engine crankcase.
- Remove the nut and collect the washer.

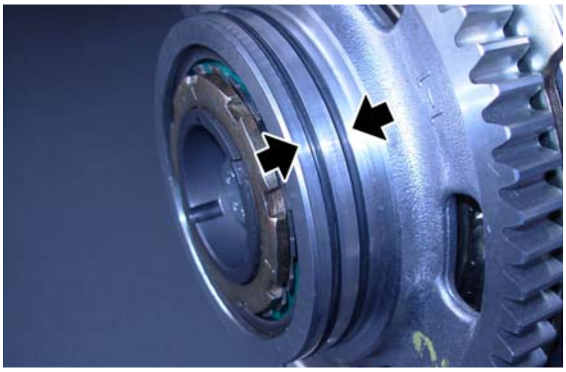


- Remove the transmission cover.



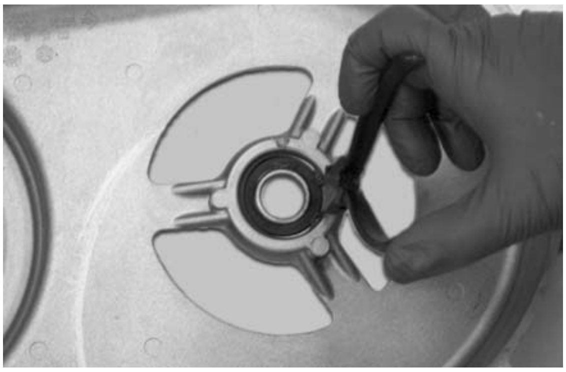
CAUTION

REPLACE THE TWO CONTROL BUSHING O-RINGS, EACH TIME THE COVER IS REMOVED.

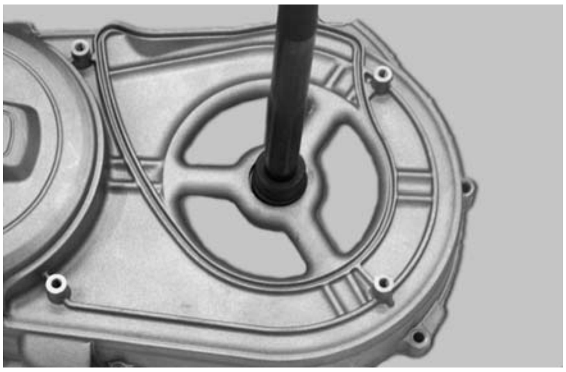


Removing the driven pulley shaft bearing

- Remove the transmission cover.
- Remove the Seeger ring.



- Place the transmission cover on a wooden surface and use the special tool so that it is adequately supported.
- Extract the bearing with the specific tool.



NOTE

BELL MUST BE PLACED INTO THE TRANSMISSION COVER, CLOSE TO THE BEARING SEAT AND THE WOODEN SURFACE, SINCE WITHOUT BELL THE ENTIRE COVER STRUCTURE WOULD BEND; NOT ONLY IN THE AREA OF MAXIMUM STURDINESS.

Specific tooling

001467Y002 Bell for 73 mm outside diameter bearing

020376Y Punch adaptor

020357Y 32 x 35 mm adaptor

020363Y 20-mm Oil seal guide

Refitting the driven pulley shaft bearing

- Heat the transmission cover inside with a heat gun.

Specific tooling

020151Y Heat gun

- Fit the bearing onto the special tool with a little grease to prevent it from coming out.
- Refit the new bearing with the specific tool.

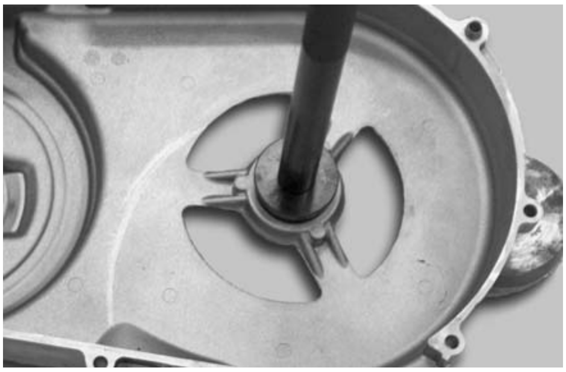
Specific tooling

020376Y Punch adaptor

020359Y 42 x 47 mm punch

020363Y 20-mm Oil seal guide

- Refit the Seeger ring.



Removing the bearing of the driving pulley control bushing



- Undo and remove the three screws, the relevant washers and remove the bearing.

Removing the bearings supporting the electric motor driving shafts

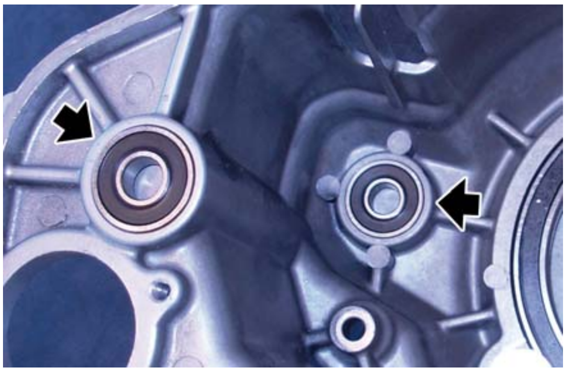
- Remove the gear.



- Extract the two bearings with the specific tool.

Specific tooling

8140180 Extractor for bushings



Fitting the bearings supporting the electric motor driving shafts

- Heat the transmission cover inside with a heat gun.

Specific tooling

020151Y Air heater



- Fit the bearings on the specific tools and refit the new bearings.



Gearshift control shaft removal

- Undo the screw and collect the two washers, the plate, the O-ring, the two balls and the spring.



- Slide off the assembled gear control shaft, collect the washer and the O-Ring.



Removing the driven pulley

See also

Removing the driving pulley

Inspecting the clutch drum

- Make sure that the clutch bell is not worn or damaged.
- Measure the clutch bell inside diameter.



NOTE

CHECK THE ECCENTRICITY FOUND; 0.2 MM MAX.

Characteristic

Max. value:

175.5 mm

Standard value:

175+0+0.2 mm

Removing the clutch

Remove the clutch with the driven pulley using the specific tool.

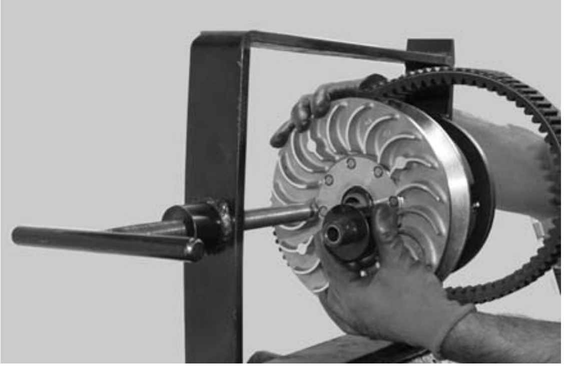
CAUTION

WHILE PERFORMING THESE OPERATIONS, AVOID CONTACT WITH OIL OR GREASE WHICH COULD MAKE THE CONTACT SURFACES BETWEEN THE BELT AND THE HALF-PULLEYS SLIPPERY.

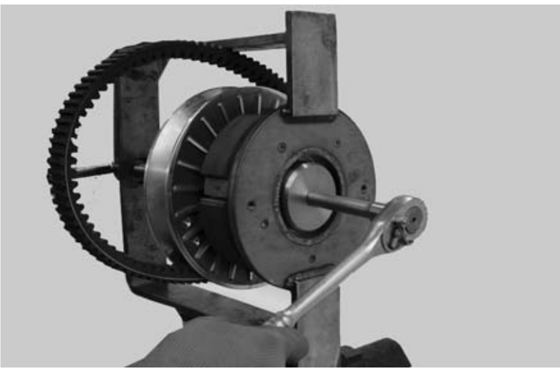
Specific tooling

020659Y Tool to remove clutch and repl. belt

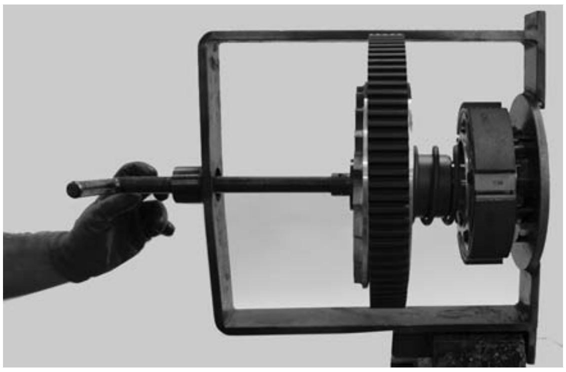
- Place the clutch assembly on the tool by inserting the pins in the ventilation holes.
- Fit the centring bushing until it stops.



- Unscrew the ring nut with the adaptor.



- Screw until the clutch is completely disassembled.



Inspecting the clutch

- Check the thickness of the clutch mass friction material.

Characteristic

Minimum thickness allowed:

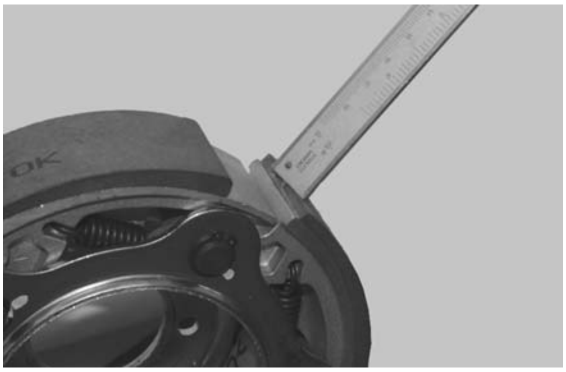
1 mm

- The masses must not show traces of lubricants. In that case, check the driven pulley unit sealing.

NOTE

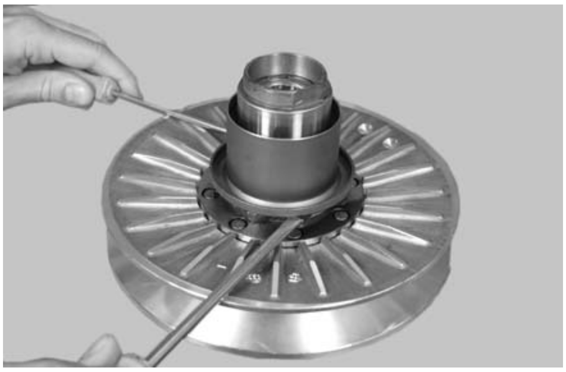
UPON RUNNING-IN, THE MASSES MUST EXHIBIT A CENTRAL FAYING SURFACE AND MUST NOT BE DIFFERENT FROM ONE ANOTHER. DIFFERENT CONDITIONS MAY CAUSE CLUTCH TEARING.

- To avoid variation in the return spring load, do not use tools to open the masses.

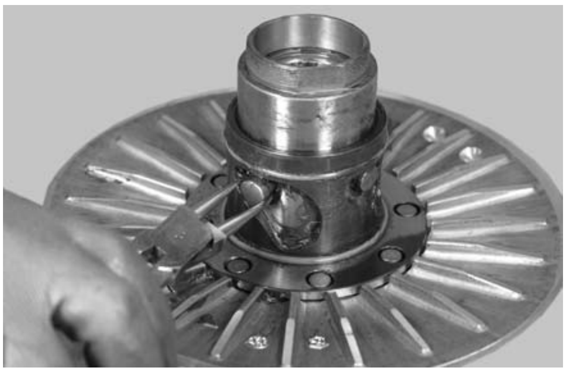


Pin retaining collar

- Slide off the collar with the aid of 2 screwdrivers.



- Remove the 4 guide pins.
- Slide off the movable driven half-pulley.



Removing the driven half-pulley bearing

- Check there are no signs of wear or damage on the bushing; otherwise replace the fixed driven half-pulley.
- Remove the snap ring with pliers.



- With the special tool inserted through the roller bearing, pull out the ball bearing.

NOTE

PROPERLY SUPPORT THE PULLEY TO PREVENT DAMAGING THE THREADING.

Specific tooling

020376Y Punch adaptor

020456Y Ø 24 mm punch

020364Y 25 mm oil seal guide



NOTE

TO PERFORM A SERVICE ON THE BEARINGS ON A FITTED DRIVEN PULLEY UNIT, SUPPORT THE UNIT BY THE BELL.

Specific tooling

001467Y002 Bell for 73 mm outside diameter bearing

-Remove the roller bearing with the specific tool, supporting the fixed half-pulley with the bell.

Specific tooling

020376Y Punch adaptor

020375Y 28 x30 mm Punch

020183Y 30 mm guide

001467Y002 Bell for 73 mm outside diameter bearing



Inspecting the driven fixed half-pulley

- Check that the belt contact surface is free from wear.
- Measure the outside diameter of the pulley bushing.



Characteristic

Minimum diameter allowed:

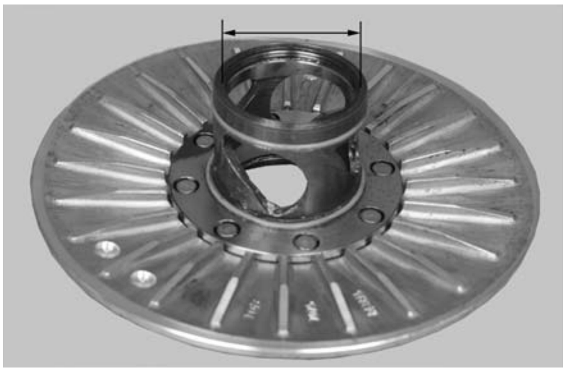
54.91 mm

Standard diameter:

55.00-0.015 -0.035 mm

Inspecting the driven sliding half-pulley

- Check that the belt contact surface is free from wear.
- Remove the 2 inner sealing rings and the 2 external O-rings.
- Measure the inside diameter of the movable half-pulley bushing.



Characteristic

Maximum diameter allowed:

55.05 mm

Standard diameter:

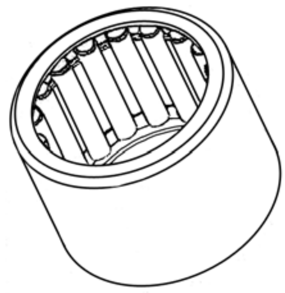
55.00 +0.035 0.00 mm

Refitting the driven half-pulley bearing

- Fit a new roller bearing with the specific tool.

NOTE

PLACE THE BEARING WITH THE WORDING AND THE BUILT IN OIL SEAL FACING OUTWARDS.



- Properly support the half-pulley to prevent damaging the threading.

If you are working on the driven pulley assembly fully fitted, use the specific tool.

Specific tooling

020478Y Punch for roller casing

001467Y002 Bell for 73 mm outside diameter bearing



- Fit a new ball bearing with the specific tool.

Specific tooling

020376Y Punch adaptor

020477Y 37 mm punch

020364Y 25 mm oil seal guide



- Fit the Seeger ring.

Refitting the driven pulley

- Fit the new oil seals.
- Fit the new O-rings.

NOTE

THE O-RINGS ARE OF TWO SIZES. THE LARGE ONE IS FITTED ON THE MACHINING END RADIUS; AT THE BASE OF THE HALF-PULLEY.

- Fit the half-pulley on the bushing being careful not to damage the top sealing ring during the fitting.
- Make sure the pins and collar are not worn, refit the pins and the collar.



- Using a curved-spout grease gun, lubricate the driven pulley assembly with approximately 10 grams of grease. Apply the grease through one of the holes in the bushing until grease comes out through the hole on the opposite side. This procedure is necessary to prevent the presence of grease beyond the O-rings.

Recommended products

AGIP GREASE SM 2 Grease for the C-ring of the tone wheel

Soap-based lithium grease containing NLGI 2 Molybdenum disulphide; ISO-L-XBCHB2, DIN KF2K-20

Inspecting the clutch spring

- Measure the length of the movable driven half-pulley spring, when unloaded.



Characteristic

Standard length:

190.2 mm

Limit allowed after use:

182 mm

Refitting the clutch

- Prepare the specific tool for the removal phase.
- Preassemble the driven pulley unit.
- Fit the driven pulley unit, the spring with sheath and clutch into the tool.

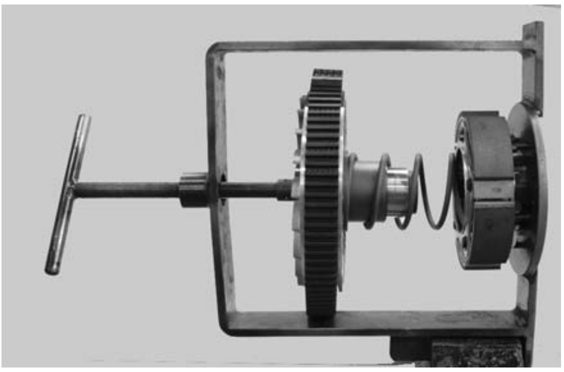
CAUTION

WHILE PERFORMING THESE OPERATIONS, AVOID CONTACT WITH OIL OR GREASE

WHICH COULD MAKE THE CONTACT SURFACES BETWEEN THE BELT AND THE HALF-PULLEYS SLIPPERY.

Specific tooling

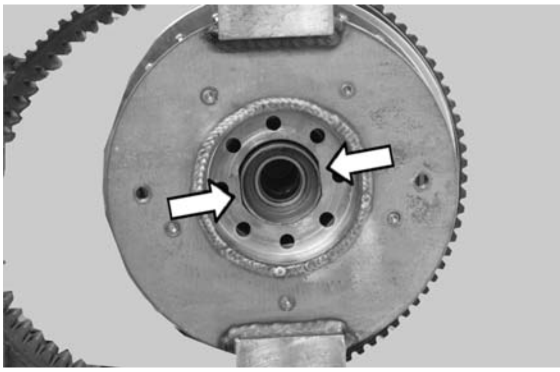
020659Y Tool to remove clutch and repl. belt



- Compress the spring and fit the clutch on the driven pulley bushing.

NOTE

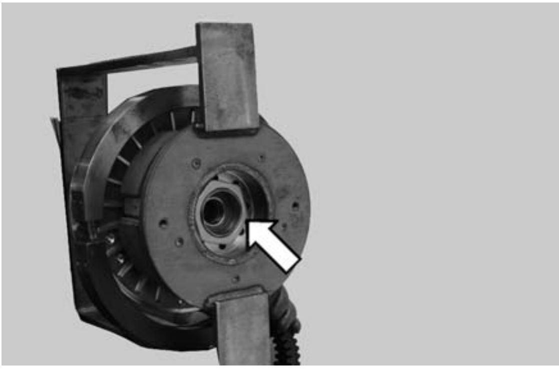
BE CAREFUL NOT TO DAMAGE THE SHEATH OR THE BUSHING THREADED END.



- Screw the locking ring nut and tighten to the prescribed torque.

Locking torques (N*m)

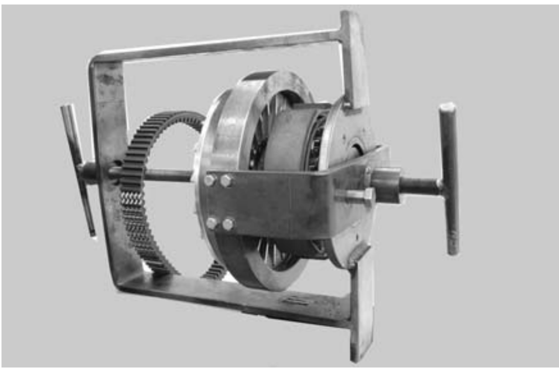
Clutch ring nut 65 - 75



- With a specific tool, separate the two half-pulleys and fit the belt according to its direction of rotation.

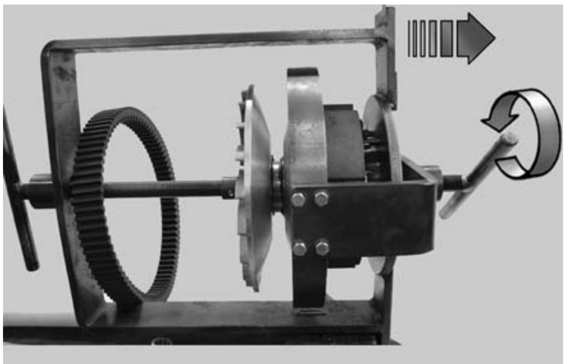
CAUTION

PLACE THE TWO HALF-RINGS CORRECTLY SO THAT THEY PERFECTLY ADHERE TO THE HALF-PULLEY.

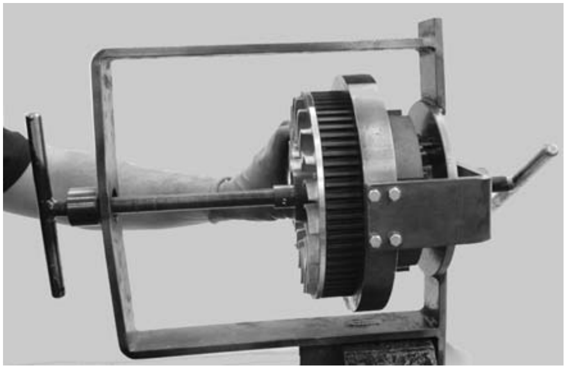




- Screw the tool so as to separate the two half-pulleys.



- Position the belt.



- Unscrew until the tool frees from the half-pulley and remove it.

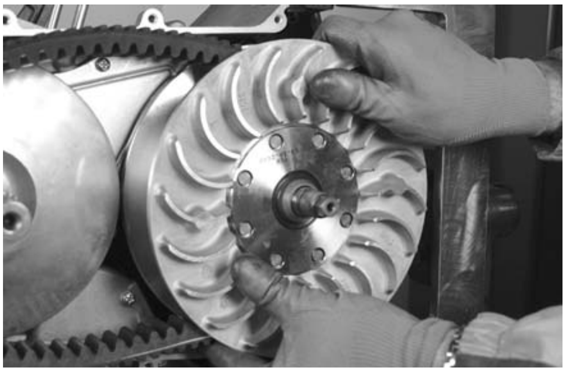


Refitting the driven pulley

- Fit the driving belt in driven pulley with the spe-

cific tool.

- Fit the assembled unit on the shaft.

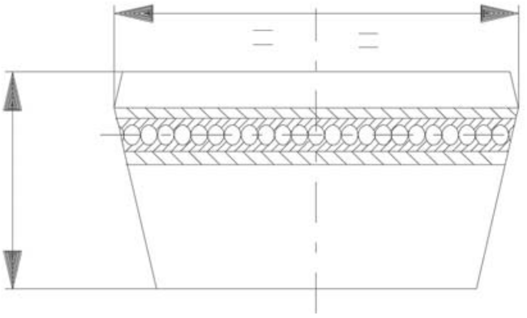


See also

Refitting the clutch

Drive-belt

- Make sure that the driving belt is not damaged.
- Check belt for correct width.



Characteristic

Standard width

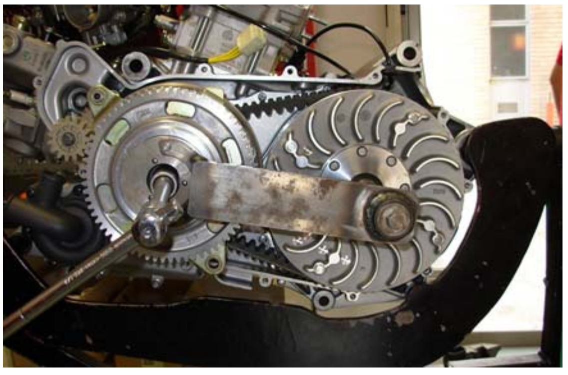
28.9 ± 0.2 mm

Standard height

16.9 ± 0.6 mm

Removing the driving pulley

- Lock the driving pulley using the specific tool.



Specific tooling

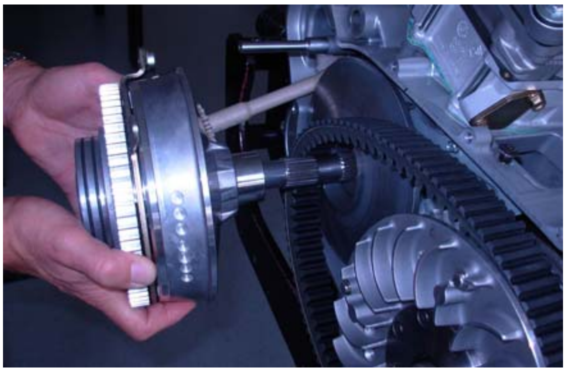
020660Y Driving pulley check ring

- Undo, remove the fixing screw and collect the washer.

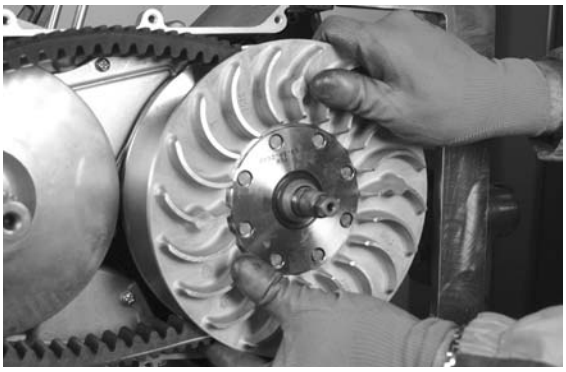
- Extract the gear from the seat removing it from the control bushing (remove completely after extracting the pulley).



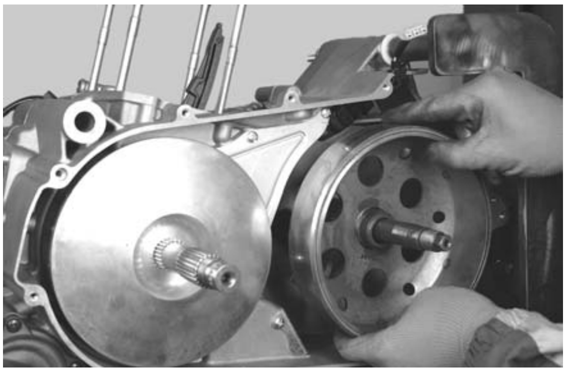
- Remove the movable pulley unit.



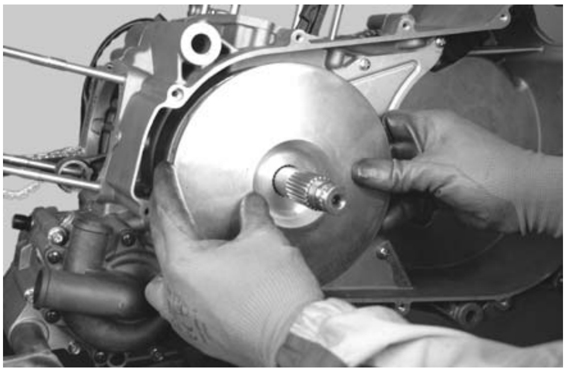
- Remove the driven pulley with the belt.



- Remove the clutch bell.



- Remove the driving half-pulley.

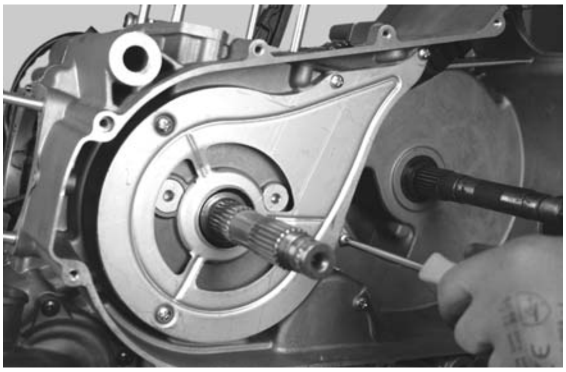


- Remove the spacer.

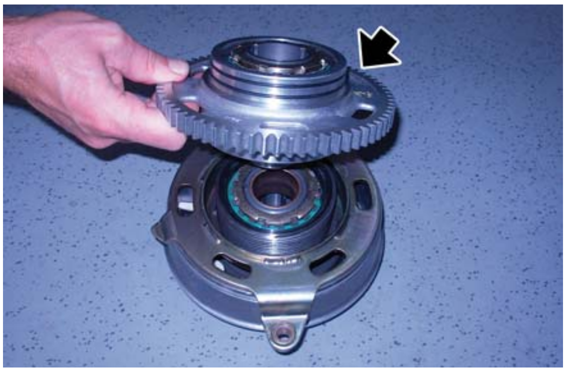
NOTE

THE SPACER IS CONICAL, UPON REFITTING PAY ATTENTION TO INSERT IT WITH THE SMALLER DIAMETER FACING THE INSIDE.

- Undo the five fixing screws and remove the air switch.



- Unscrew the control bushing from the driving pulley.



- Remove the ring nut and the stop washer from the driving pulley with a wrench available in the market.



- Remove the complete advancement bushing.



- Undo the four fixing screws and remove the bearing support.





- Remove the slider support with the relevant sliders from the movable driving half-pulley.



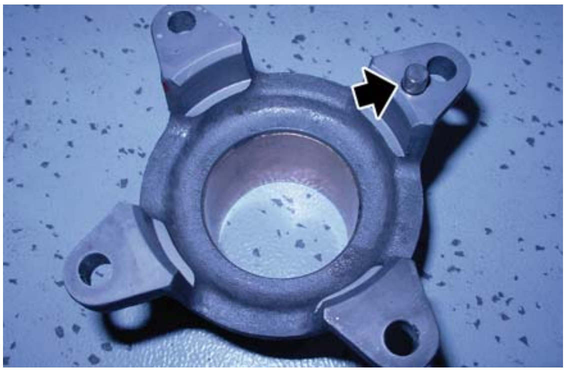
Refitting the driving pulley

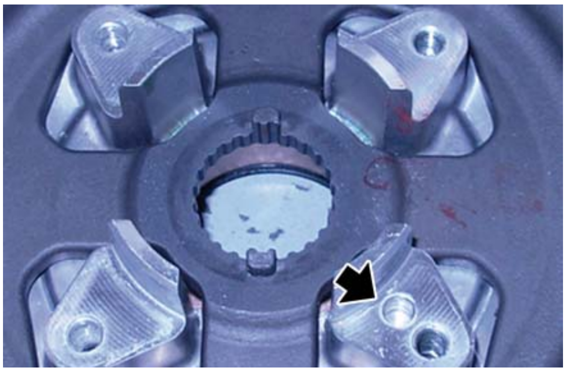
- Fit the plate with the pads on the movable driv-

ing half-pulley.



- Fit the bearing support being careful with the dowel pin and tighten the four screws with Loctite 270.





- Fit the advancement bushing.



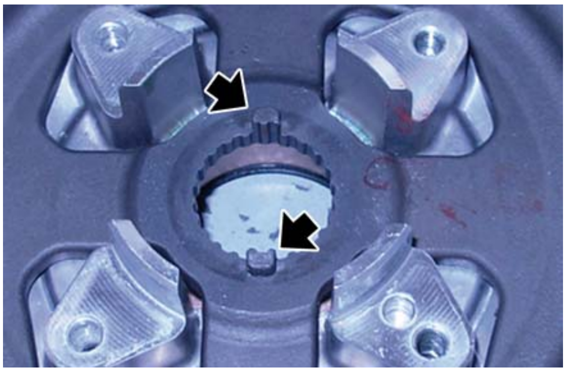
- Fit the stop washer and tighten the ring nut with the level surface facing upwards.

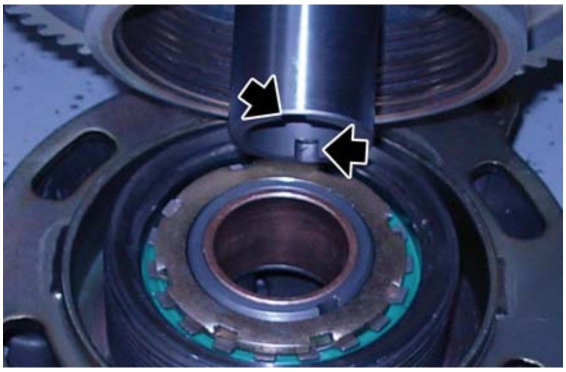


- Screw the control bushing to the complete movable driving half-pulley. Push the bushing and check that the bushing sliding axis and the slider support engage by means of the two teeth.
- Once the gear checking is finished, unscrew the driving pulley 1/2 of a turn.

CAUTION

MAKE SURE THERE IS A CORRECT GEAR BETWEEN THE TOOTHED BUSHING AND THE PAD SUPPORT.





- Preassemble the belt on the rear pulley with a special tool.

Specific tooling

020659Y Tool to remove clutch and repl. belt

- Fit the unit following the removal steps but in reverse order with the specific tool being careful to tighten to the prescribed torques.

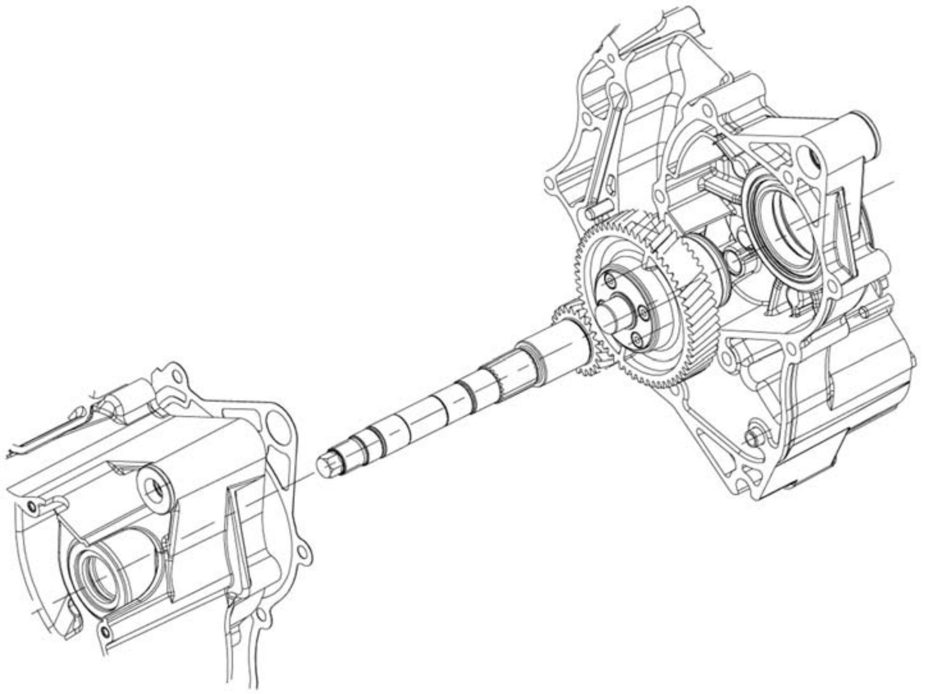
Refitting the transmission cover

- Follow the removal steps but in reverse order being careful to tighten to the prescribed torques with the specific tool.

Locking torques (N*m)

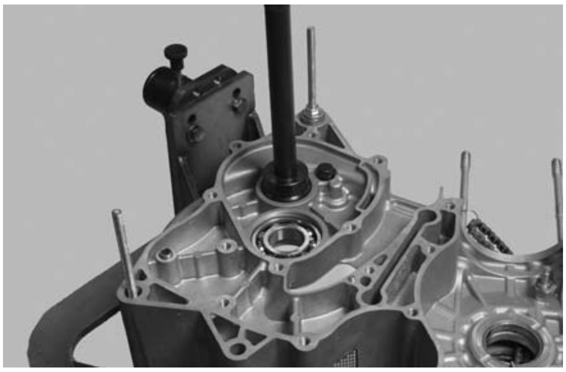
Driven pulley nut 153 ÷ 187 Internal transmission cover screws 11 ÷ 13 External transmission cover screws 5 ÷ 7

End gear



PINION UNIT AXLE BEARING FITTING

- The toothed wheel (pinion unit axle), rotates on two bearings located on the two crankcase halves, for fitting follow these instructions.
- Transmission side crankcase halves:
- Heat up the crankcase using the thermal gun.



Specific tooling

020151Y Heat gun

- Fit the pinion unit axle bearing until it abuts against the bottom of the seat with the specific tool.

Specific tooling

020376Y Punch adaptor

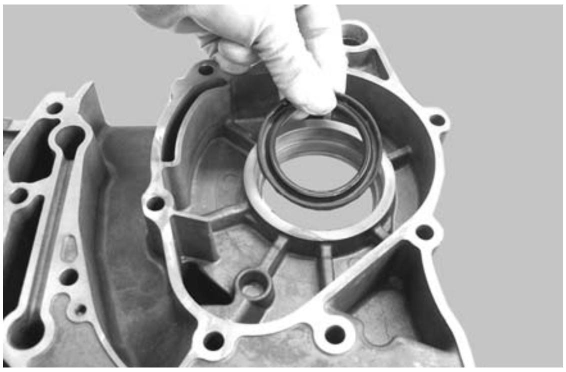
020363Y 20-mm Oil seal guide

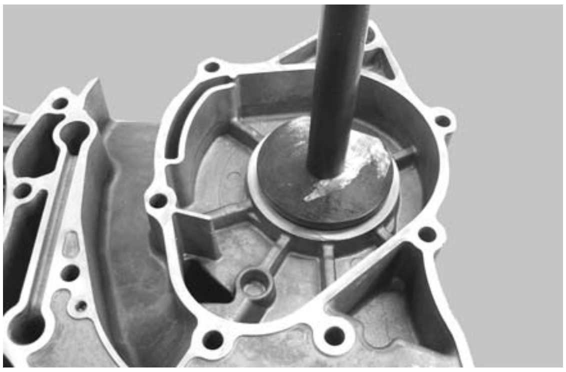
020359Y 42 x 47 mm punch

- Flywheel side crankcase halves:
- Heat up the crankcase using the thermal gun.

Specific tooling

020151Y Heat gun





- Fit the oil seal until it abuts against the bottom of the seat using the specific tool.

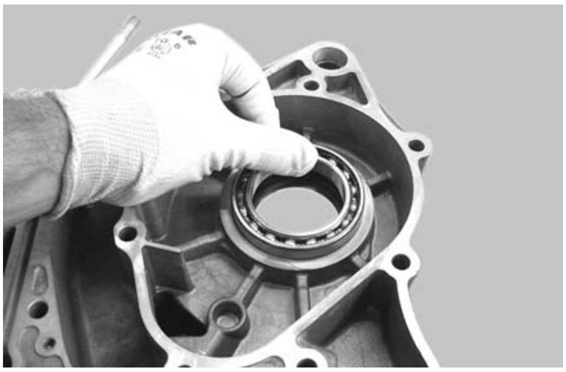
Specific tooling

020376Y Punch adaptor

020655Y Adaptor 62x68 mm

020662Y 50 mm guide

- Insert the driven pulley shaft bearing up to the stop against the bottom of the seat with the specific tool.

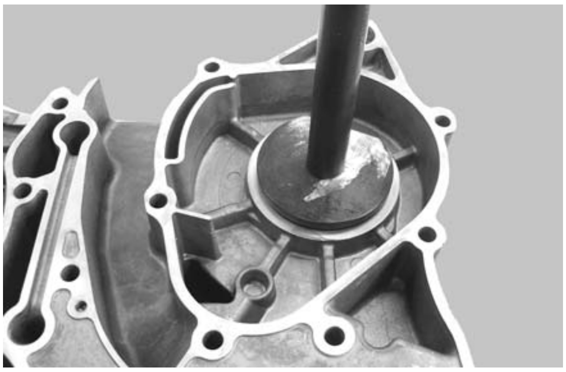


Specific tooling

020376Y Punch adaptor

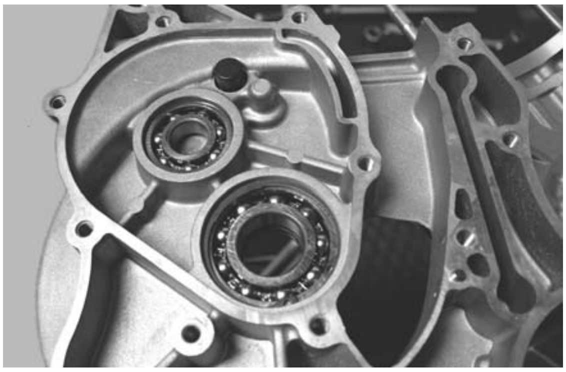
020655Y Adaptor 62x68 mm

020662Y 50 mm guide



PINION UNIT AXLE BEARING REMOVAL

- The toothed wheel (pinion unit axle), rotates on two bearings located on the two crankcase halves, to replace follow these instructions.
- Transmission side crankcase halves:
- Remove the driven pulley shaft axle and the toothed wheel.

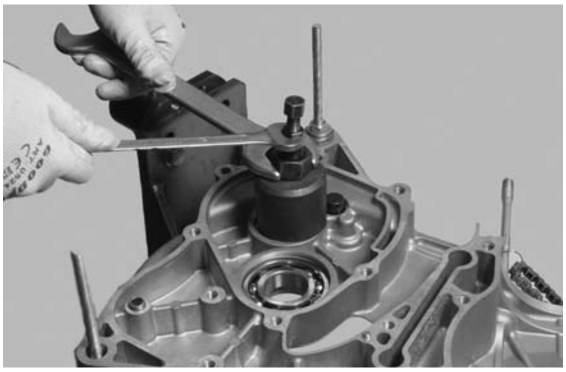


- Operating on the specific tool extract the bearing.

Specific tooling

001467Y006 Pliers to extract 20 mm bearings

001467Y035 Bell



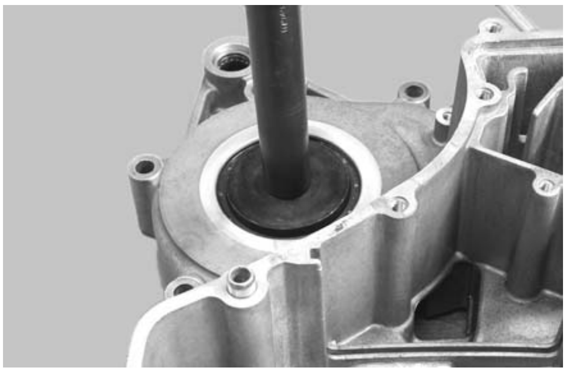
- Flywheel side crankcase halves:
- Remove the oil seal and the bearing with the specific tool.

Specific tooling

020376Y Punch adaptor

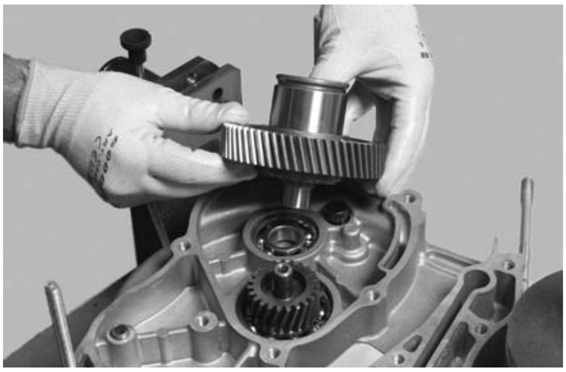
020662Y Guide 50 mm

020360Y Adaptor 52x54 mm

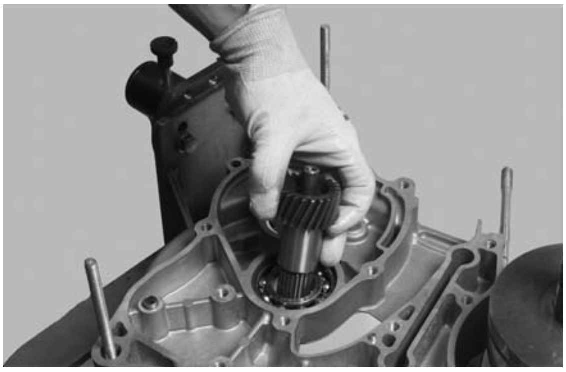


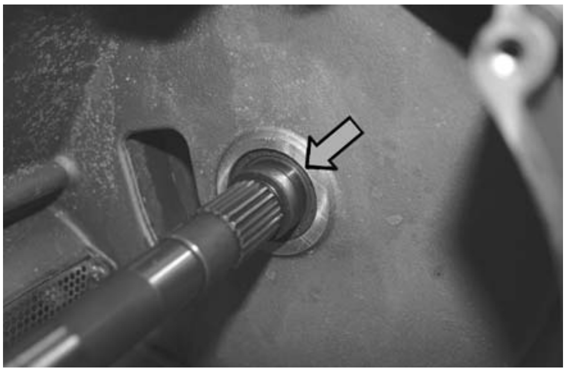
Removing the driven pulley shaft bearing

- Slide off the toothed wheel (pinion unit axle).

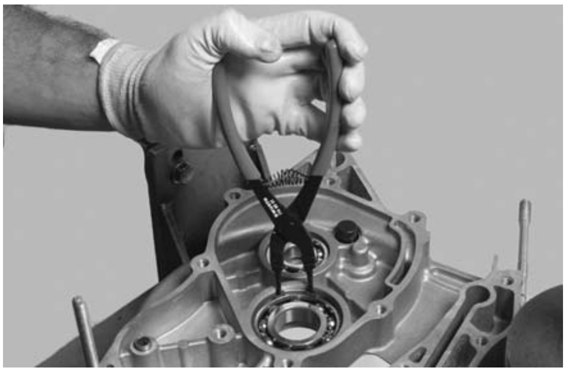


- Slide of the driven pulley shaft from one side and remove the oil seal from the other side with a screwdriver.





- Remove the Seeger ring.



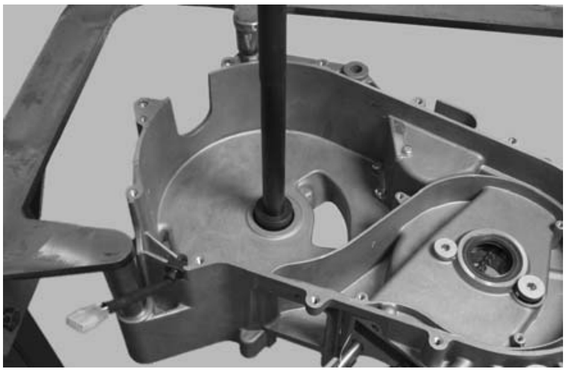
- With the specific tool, remove the bearing.

Specific tooling

020376Y Punch adaptor

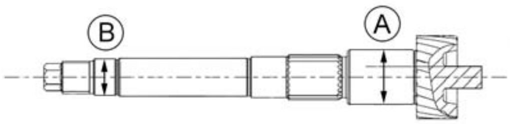
020483Y 30 mm punch

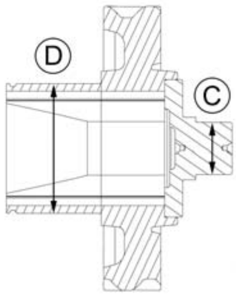
020358Y 37 x 40 mm punch



Inspecting the hub shaft

- Check the two shafts for wear or distortions on the toothed surfaces, on the bearing housings and the oil seal positions.
- If faults are found, replace the damaged parts.



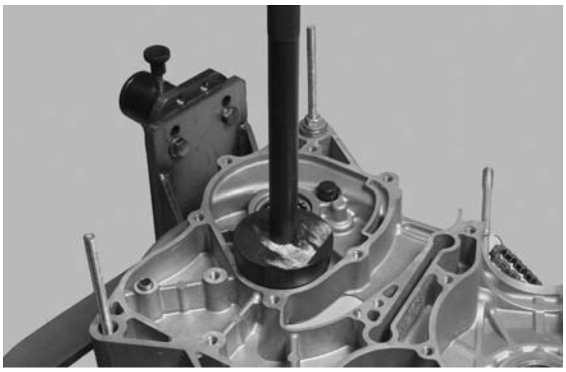


Refitting the driven pulley shaft bearing

- Heat up the crankcase using the thermal gun.

Specific tooling

020151Y Heat gun



- Insert the driven pulley shaft bearing up to the stop against the bottom of the seat with the specific tool.

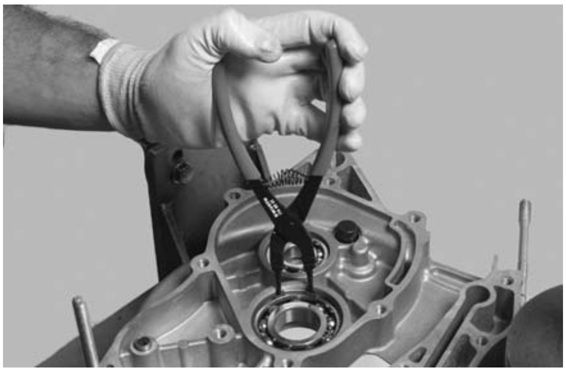
Specific tooling

020376Y Punch adaptor

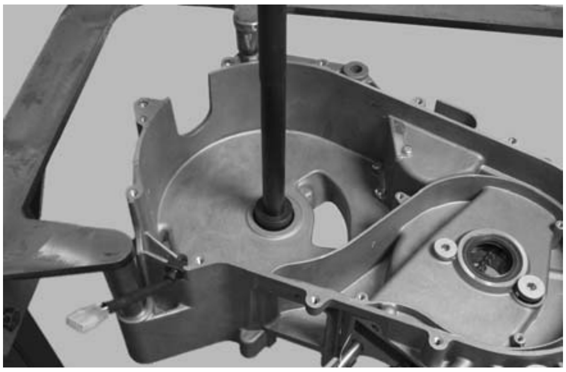
020483Y 30 mm punch

020655Y Adaptor 62x68 mm

- Fit the Seeger ring.

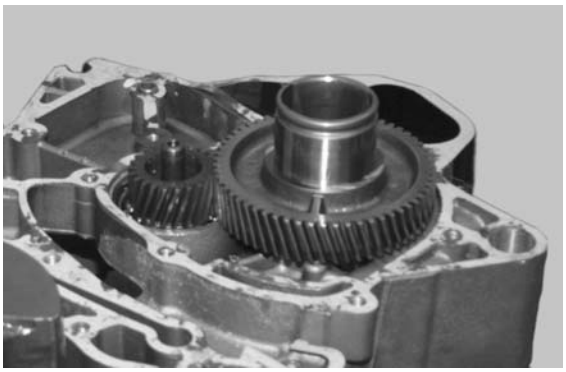


- From outside the transmission side crankcase halves, fit the oil seal.



Refitting the hub bearings

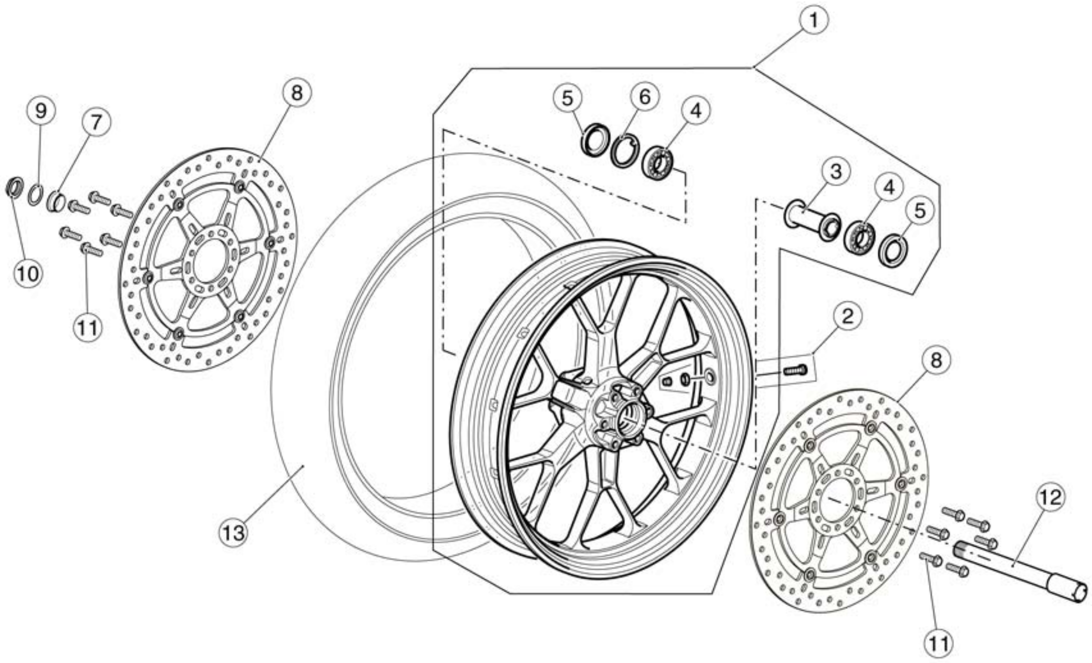
- Place the two shafts as shown in the figure.



INDEX OF TOPICS

Front

Removing the front wheel

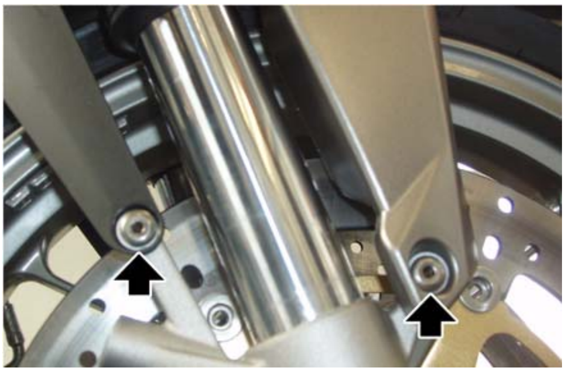


Key:

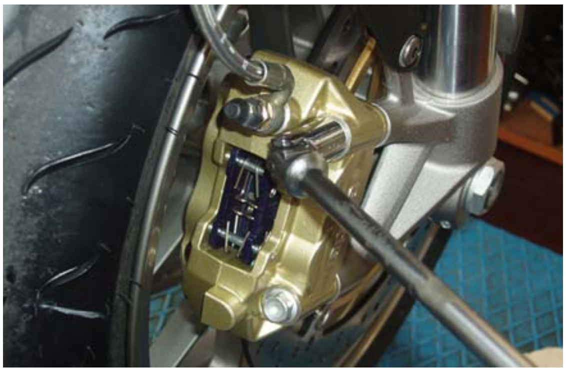
1. Front wheel 3.5"x17"
2. Tubeless valve
3. Internal spacer
4. Bearing
5. Sealing ring 30x47x7
6. Seeger ring
7. Front wheel right external spacer
8. Front brake disc
9. Washer 25.2x36x1
10. Wheel pin nut
11. TE flanged screw M8x20
12. Front wheel pin
13. Front cover 120/70 ZR 17"

- Hold the scooter front part.

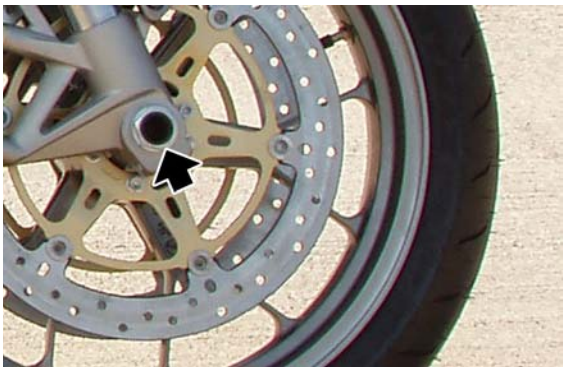
- Undo the screws fixing the front mudguard and remove it.



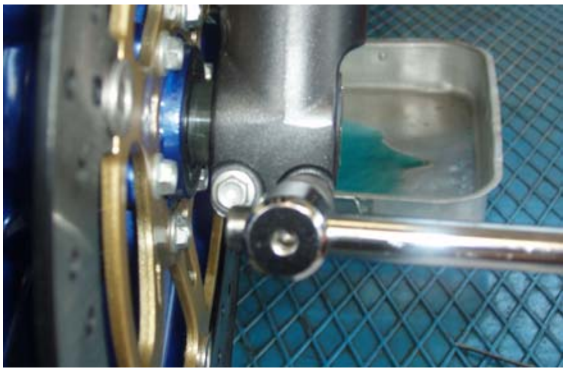
- Undo the screws fixing the front pliers and slide them off the disc.



- Remove the wheel pin fixing nut.
- Collect the sealing washer.



- Loosen the screws on the wheel pin clamps.



- Tap the wheel pin with a rubber ham-mer so that the holes on the opposite

side are exposed.

- Remove the wheel pin by inserting a screwdriver in the holes on the pin.



- During extraction, support the wheel and then remove it.

- Collect the spacer from the front wheel left side.



Checking the front wheel

FRONT WHEEL BEARINGS

Carry out the check with the bearings fitted on the wheel.

CHECK THAT ALL THE PARTS ARE IN GOOD CONDITIONS, ESPECIALLY THOSE MENTIONED BELOW.

ROTATION CHECK

- Manually rotate the inside ring of each bearing. Rotation must be constant, smooth and noiseless.

If one or both bearings do not fall within the control parameters:

- Replace both wheel bearings.

RADIAL AND AXIAL CLEARANCE CHECK

- Check the radial and axial clearance.

Axial clearance: a minimum axial clearance is allowed.

Radial clearance: none.

If one or both bearings do not fall within the control parameters:

- Replace both wheel bearings.

ALWAYS REPLACE BOTH BEARINGS.
ALWAYS REPLACE THE BEARINGS WITH OTHERS OF THE SAME TYPE.

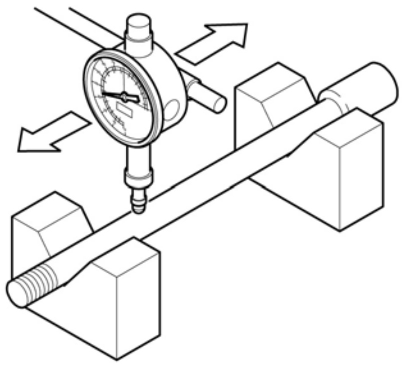
GASKETS

- Check that the gaskets are in good conditions; replace them if they show signs of damage or excessive wear.

ALWAYS REPLACE BOTH GASKETS.
ALWAYS REPLACE THE GASKETS WITH OTHERS OF THE SAME TYPE.

WHEEL PIN

- Using a dial gauge, check the wheel pin eccentricity. If the eccentricity exceeds the limit value, replace the wheel pin.

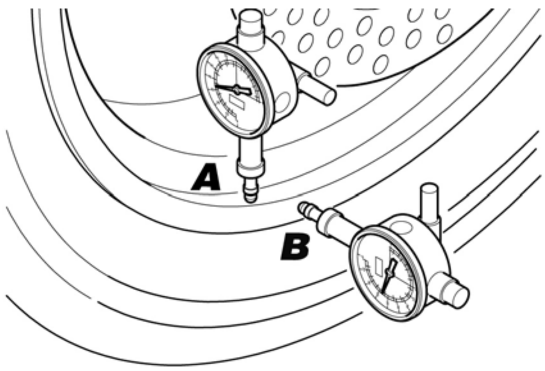


Characteristic

Maximum eccentricity:

0.25 mm (0.0098 in)

- Using a dial gauge, check that the radial (A) and the axial (B) eccentricities of the rim do not exceed the limit value. An excessive eccentricity is usually caused by worn or damaged bearings. Replace the rim if, after replacing the bearings, the value is not within the specified limit.

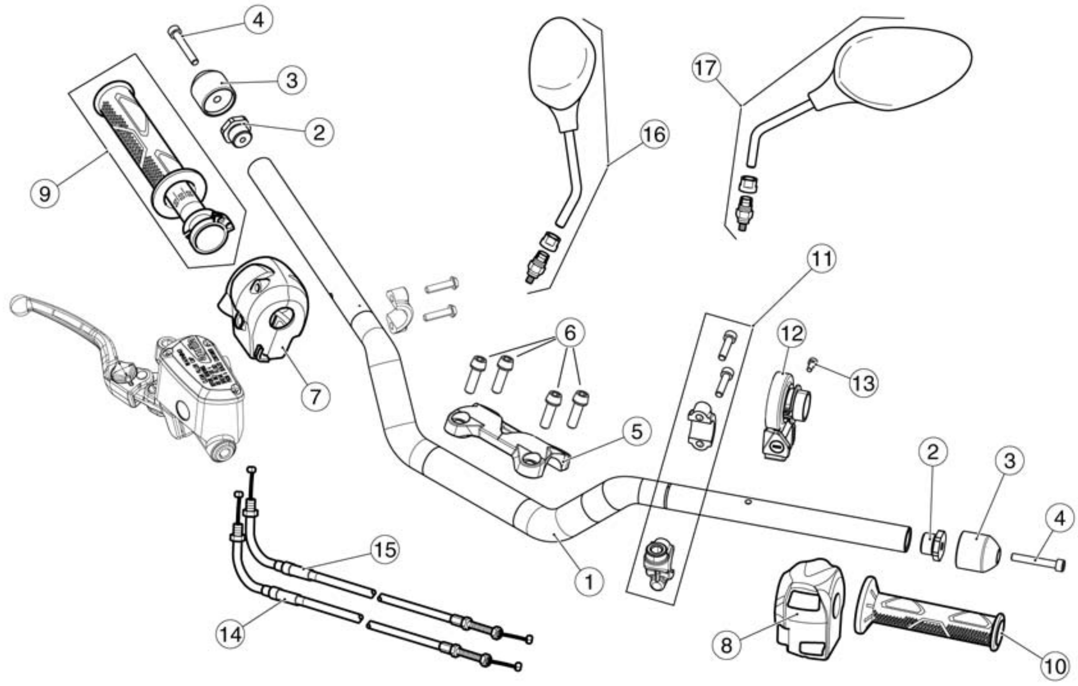


Characteristic

Maximum radial and axial eccentricity:

2 mm (0.0079 in)

Handlebar

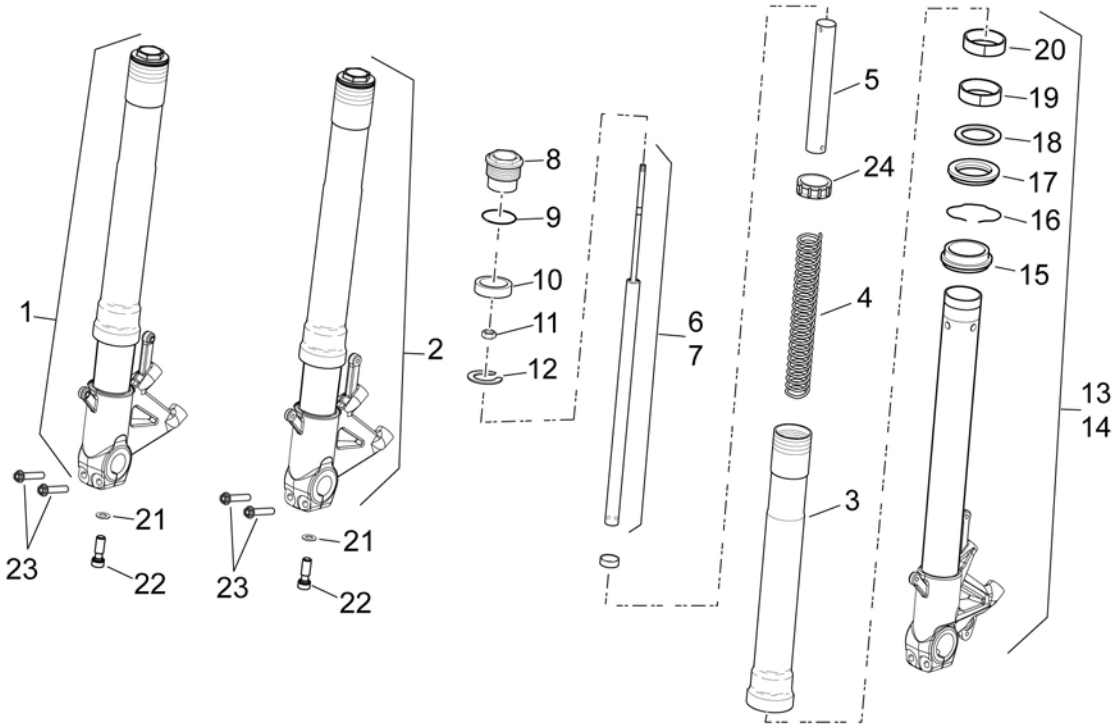


Key:

1. Handlebar
2. Anti-vibration weight fix. end
3. Anti-vibration weight v.
4. Screw M6x40
5. Handlebar upper U-bolt
6. TCC screw M8x25
7. Right light switch
8. Left light switch
9. Right hand grip with throttle control
10. Gear left hand grip
11. Mirror support
12. Gear control device
13. Screw M4x10
14. Throttle opening cable
15. Throttle closing cable
16. Right mirror
17. Left mirror

Front fork

Diagram



Key:

1. Fork right stem
2. Fork left stem
3. Sleeve
4. Spring
5. Preloading pipe
6. Right pumping member assembly
7. Left pumping member assembly
8. Sleeve cap assembly
9. O-ring
10. Rubber ring
11. Nut
12. Snap ring
13. Stem+ right wheel holder assembly
14. Stem+ left wheel holder assembly
15. Dust guard
16. Seeger ring
17. Oil seal

18.Ring

19.Guide bushing

20.Sliding bushing

21.Special washer

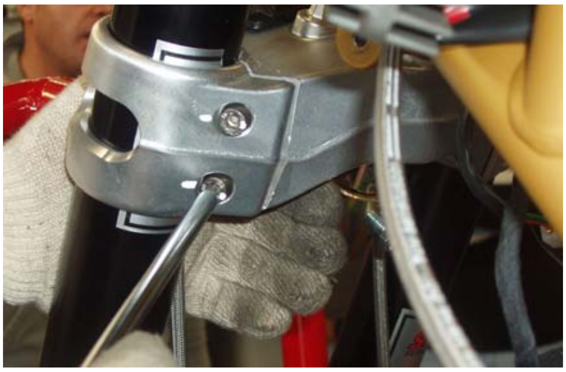
22.Screw M10x1.5

23.TE flanged screw M8x40

24.Spring Centring

Removing the fork legs

- Remove the front wheel.
- Support the fork stem and loosen the screws on the upper and then the lower plate.
- Remove the fork stem.





Draining oil

NOTE

THE OPERATIONS DESCRIBED BELOW ARE VALID FOR BOTH STEMS.

NOTE

BEFORE CARRYING OUT THE FOLLOWING OPERATIONS GET A CONTAINER WITH SUITABLE CAPACITY TO COLLECT THE OIL.

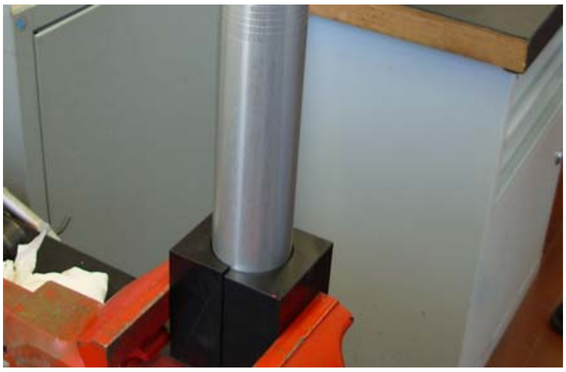
- Remove the fork.

- Being careful not to damage the fork stem when placing it in a vice, in ver-

tical position, using the appropriate protection.

Specific tooling

AP8140149 Protection for fitting operations



- Unscrew the sleeve cap.



- Drain the oil into a container of suitable capacity to collect fluids.



DO NOT DISPOSE OF OIL INTO THE ENVIRONMENT.
DISPOSE OF ENGINE OIL STORED IN A SEALED CONTAINER AND TAKE IT TO YOUR SUPPLIER OR TO THE NEAREST USED OIL RECLAMATION FIRM.

See also

Removing the fork legs

Disassembling the fork

NOTE

THE OPERATIONS DESCRIBED BELOW ARE VALID FOR BOTH STEMS.

- Drain the fork oil.
- Place the fork stem on a work table in upright position.

- Fit the special tool.

Specific tooling

AP8140147 Spacer tool



With the help of a second operator:

- Hold the sleeve cap firmly.
- Push the special tool down.
- Take out the Seeger ring.



With the help of a second operator:

- Insert the special tool between the nut and the preloading pipe.

Specific tooling

AP8140148 Spacer-pumping element separating plate



- Loosen the nut.



- Remove the sleeve cap.



- Slide off the preloading pipe together with the spring centring.



- Be careful not to damage the fork stem when placing it in a vice, in horizontal position, using the appropriate protections.

Specific tooling

AP8140149 Protection for fitting operations



- Unscrew and remove the bottom screw and collect the special washer.



- Slide off the pumping member together with the spring.



- Remove the dust guard using a screwdriver as a lever.



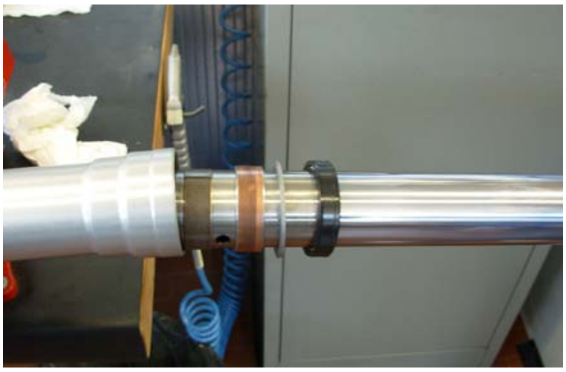
- Remove the Seeger ring from inside the sleeve with the aid of a screwdriver.

CAUTION

DO NOT DAMAGE THE STEM DURING THE OPERATION.



- Slide off the stem forcefully.



- If necessary, remove the sliding bushing, guide bushing, ring, oil seal, See-

ger ring and dust guard from the stem.



See also

Draining oil

Checking the components

Stem

Check the sliding surface for scorings and/or scratches.

These scorings can be eliminated by rubbing them with wet sandpaper (grain 1).

If the scorings are deep, replace the stem.

Use a dial gauge to check that the stem bending is below the limit value.

If over the value, replace the stem.

CAUTION

A BENT STEM SHOULD NEVER BE STRAIGHTENED BECAUSE ITS STRUCTURE WOULD BE WEAKENED AND USING THE VEHICLE MAY BECOME DANGEROUS.

Characteristic

Bending limit:

0.2 mm (0.00787 in)

Sleeve

Check that there are no damages and/or cracks; otherwise, replace it.

Spring

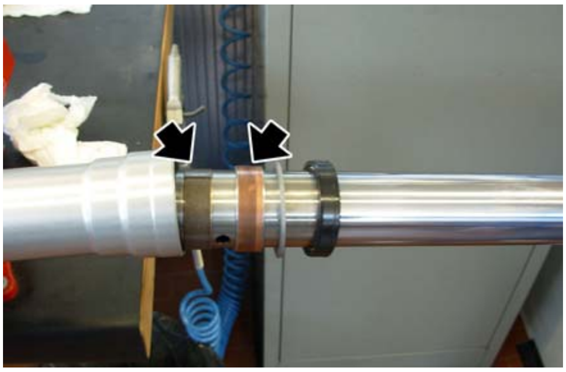
Check that the spring is in good conditions. Check that the spring length is within the limit value.

Replace the spring if its length does not fall within the limit values.

SPRING MINIMUM LENGTH WHEN UNLOADED: 300.8 mm (11.84 in)

Check that the following components are in good conditions:

- sliding bushing;
- guide bushing;



- pumping member.

If there are signs of excessive wear or damage, replace the affected component.

CAUTION

REMOVE ANY IMPURITY IN THE BUSHINGS, TAKING CARE NOT TO SCRATCH THEIR SURFACE.

Replace the following components with new ones:

- dust guard
- oil seal

Reassembling the fork

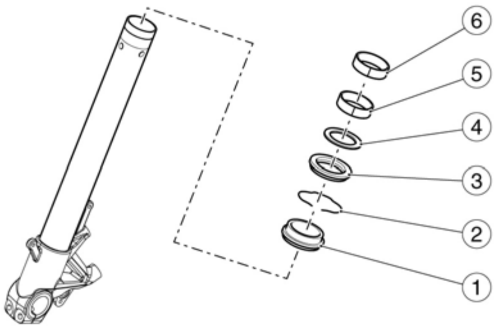
NOTE

THE OPERATIONS DESCRIBED BELOW ARE VALID FOR BOTH STEMS.

- Fit the dust guard (1), Seeger ring (2), oil seal (3), ring (4), guide bushing (5) and sliding bushing (6) on the stem.

CAUTION

FIT THE GUIDE BUSHING AND THE SLIDING BUSHING WITH CAUTION.
GUIDE BUSHING (5) IS THICKER THAN SLIDING BUSHING (6).



- Fit the stem to the sleeve and place the special fitting tool for fitting the D.43 oil seal between the Seeger ring and the oil seal.

Specific tooling

AP8140189 Oil seal fitting tool for Ø 43 mm (1.69 in) holes



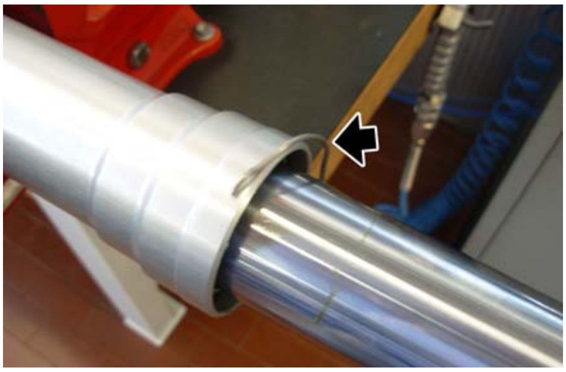
- Push the oil seal fitting special tool hard, applied towards the sleeve with the aid of the specific weight.

Specific tooling

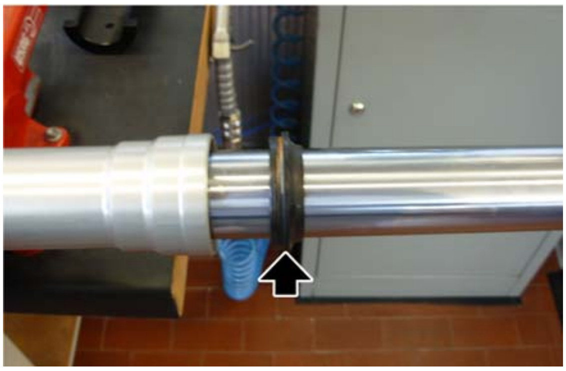
AP8140146 Weight



- Fit the Seeger ring on the sleeve seat.



- Fit the dust guard.



- Screw the specific perforated rod on the pumping member threaded rod.

Specific tooling

AP8140150 Perforated rod for pumping member air bleed



- Fit the centring plate.
- Fit the pumping member together with the centring plate in the sleeve.
- Insert the special washer in the screw.
- Tighten the screw to the prescribed torque.



UPON REFITTING, REPLACE THE SAFETY WASHER WITH A NEW ONE.

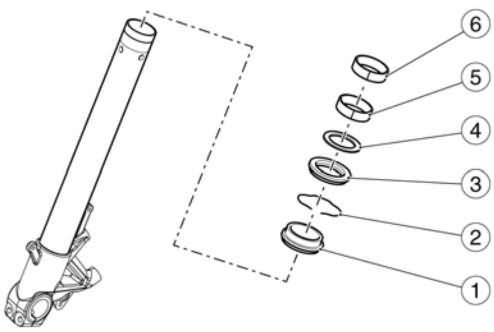
Locking torques (N*m)

Screw fixing the stem in wheel carrier - M10x1.5 (2) 20 Nm (14.75 lbf ft)

NOTE

THE OPERATIONS DESCRIBED BELOW ARE VALID FOR BOTH STEMS.

- Fit the dust guard (1), Seeger ring (2), oil seal (3), ring (4), guide bushing (5) and sliding bushing (6) on the stem.



CAUTION

FIT THE GUIDE BUSHING AND THE SLIDING BUSHING WITH CAUTION.
GUIDE BUSHING (5) IS THICKER THAN SLIDING BUSHING (6).

- Fit the stem to the sleeve and place the special fitting tool for fitting the D.43 oil seal between the Seeger ring and the oil seal.

Specific tooling

AP8140189 Oil seal fitting tool for Ø 43 mm (1.69 in) holes



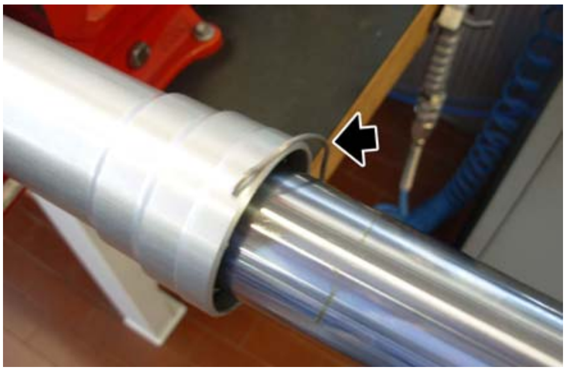
- Push the oil seal fitting special tool hard, applied towards the sleeve with the aid of the specific weight.

Specific tooling

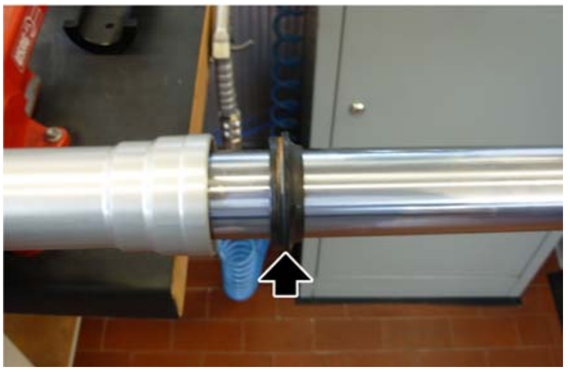
AP8140146 Weight



- Fit the Seeger ring on the sleeve seat.



- Fit the dust guard.



- Screw the specific perforated rod on the pumping member threaded rod.

Specific tooling

AP8140150 Perforated rod for pumping member air bleed





- Fit the centring plate.
- Fit the pumping member together with the centring plate in the sleeve.
- Insert the special washer in the screw.
- Tighten the screw to the prescribed torque.

UPON REFITTING, REPLACE THE SAFETY WASHER WITH A NEW ONE.

Locking torques (N*m)

Screw fixing the stem in wheel carrier - M10x1.5 (2) 20 Nm (14.75 lbf ft)

Filling oil

NOTE

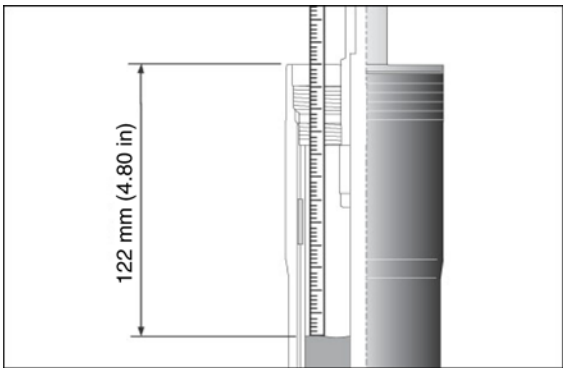
THE OPERATIONS DESCRIBED BELOW ARE VALID FOR BOTH STEMS.

- Place the fork stem on a work table in upright position.
- Fill the sleeve with the adequate quality and type of oil indicated on the recommended products table.

WARNING

MOVE THE PUMPING ELEMENT SEVERAL TIMES UNTIL AIR BUBBLES ARE SEEN ON THE OIL SURFACE.

THE SLEEVE MUST BE PERFECTLY VERTICAL FOR A CORRECT OIL LEVEL MEASUREMENT. THE OIL LEVEL MUST BE THE SAME IN BOTH STEMS.



Characteristic

Fork oil quantity (for each stem):

535 cm³ (32.65 cu.in)

Oil level (from sleeve rim, without the spring and with pumping member fully down)

122 mm (4.80 in).



- Fit the preloading pipe together with the spring centring.



- Fit the special tool.

Specific tooling

AP8140147 Spacer tool



- With the aid of a second operator, hold the pumping member rod firmly, lower the spacer retention tool, insert the stop ring and the plate separating the spacer-pumping member between the ring and the nut.



Specific tooling

AP8140148 Spacer-pumping element separating plate

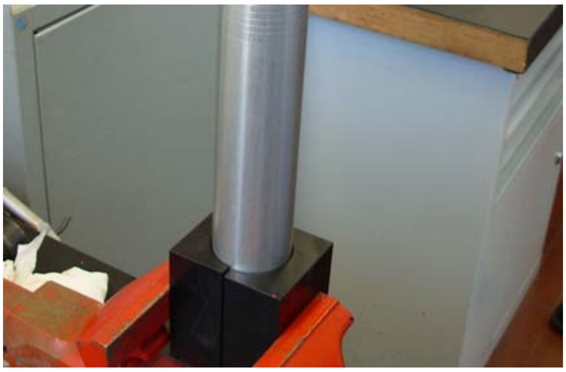
- Insert the sleeve cap and screw the nut.



- Being careful not to damage the fork stem when placing it in a vice, in vertical position, using the appropriate protection.

Specific tooling

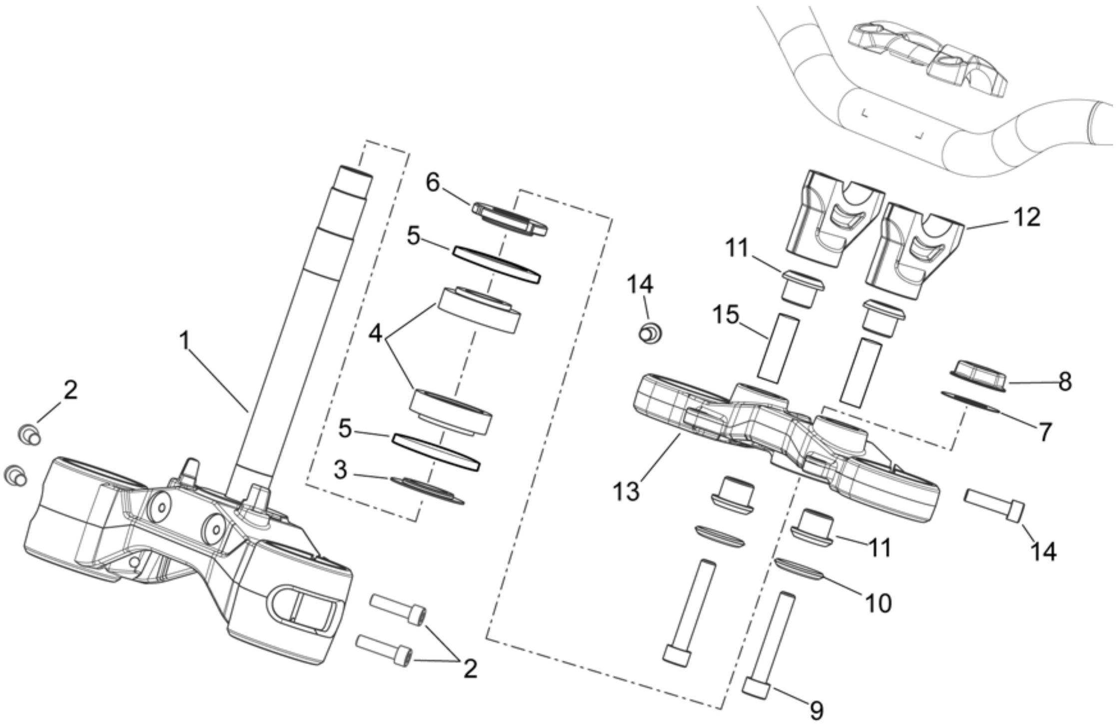
AP8140149 Protection for fitting operations



- Tighten the sleeve cap.



Steering bearing



Key:

1. Folk lower plate
2. Screw M8x30
3. Washer
4. Roller bearing
5. Sealing ring
6. Ring nut
7. Headstock cap washer
8. Headstock cap
9. TCEI screw M10x60
10. Cap
11. Rubber ring
12. Lower U-bolt
13. Fork upper plate
14. Screw M8x30
15. Spacer 10.1x14.1x38

Adjusting play

- Place the vehicle so that the front wheel is off the ground.
- Shake the fork in the riding direction.

- Adjust if clearance is detected.

- Unscrew and remove the four screws of the fixing U-bolt.
- Remove the U-bolt.
- Remove the handlebar and place it paying attention that oil in the clutch and front brake tanks does not spill out.



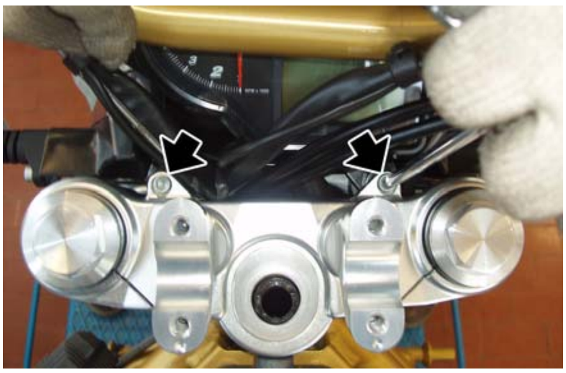
- Unscrew and remove the top bolt on the headstock and collect the washer.



- Operating from both sides, loosen the screws fixing the fork stems to the upper plate.

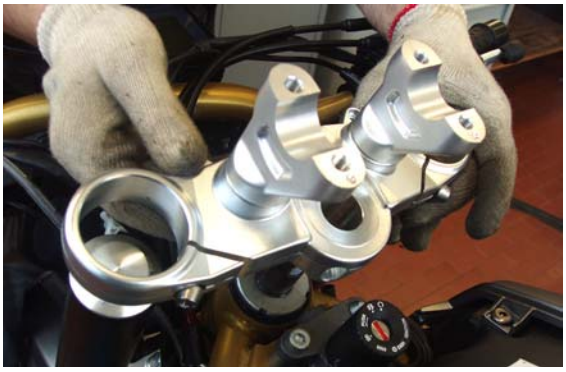


- Undo and remove the two screws fixing the instrument panel support to the fork upper plate.



- Slide off the fork upper plate by mov-

ing it towards the instrument panel.



- Adjust the steering bearings preloading by tightening the ring nut with the specific tool.

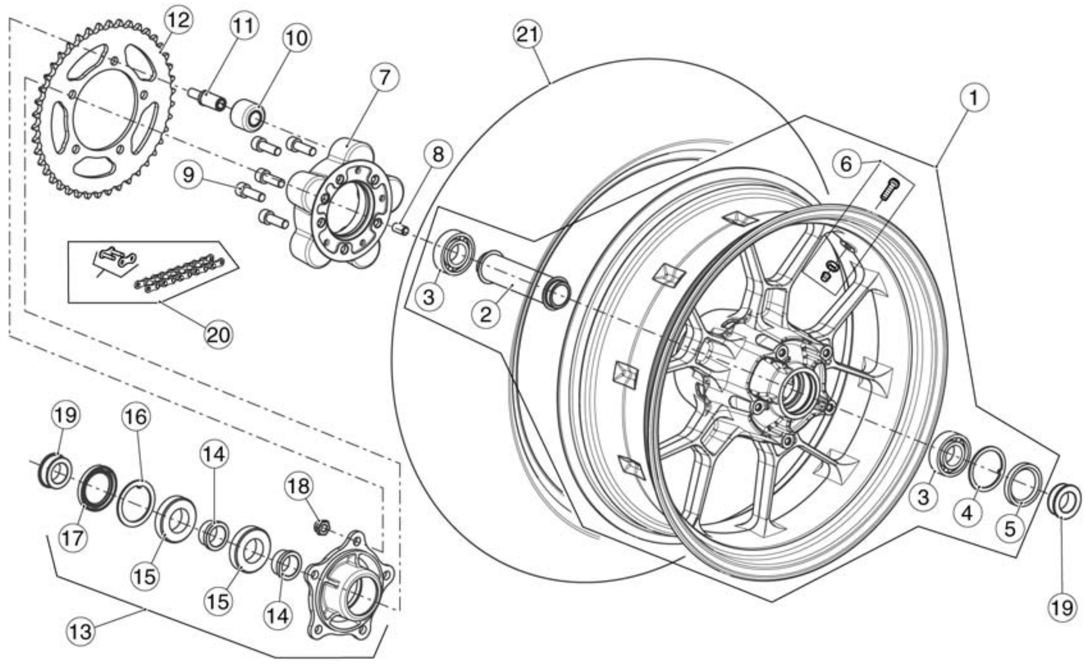


When refitting the U-bolt, position the two references facing the front part of the vehicle.



Rear

Removing the rear wheel



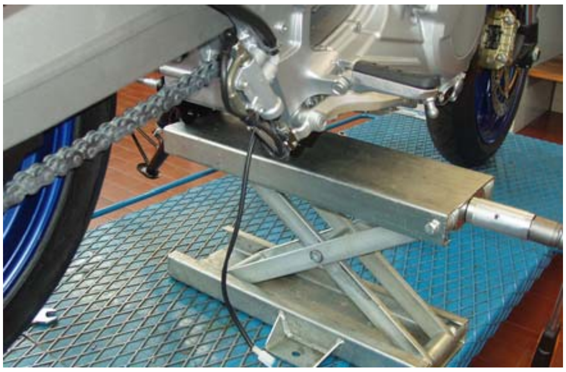
Key:

1. Rear wheel 6"x17"
2. Internal spacer
3. Bearing
4. Seeger ring
5. Sealing ring 30x52x7
6. Tubeless valve
7. Anti-vibration buffer holder
8. 10x20 Pin
9. TCEI screw M10x30
10. Anti-vibration buffer rubber ring
11. Anti-vibration buffer pin
12. Crown z=40
13. Sprocket carrier assembly
14. Anti-vibration buffer spacer
15. Bearing 30x55x13
16. Seeger ring for d55 hole
17. Sealing ring 38x52x7
18. Self-locking nut M10
19. Rear wheel spacer

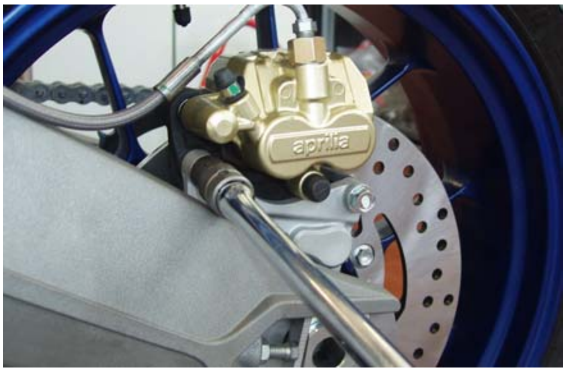
20.Complete chain

21.Rear cover

- Rest the vehicle on its centre stand.



- Undo and remove the two fixing screws.
- Remove the rear brake calliper.



- Undo and remove the two fixing screws.
- Remove the parking brake calliper.





- Working from the vehicle right side, unscrew and remove the rear wheel pin fixing nut and collect the washer.



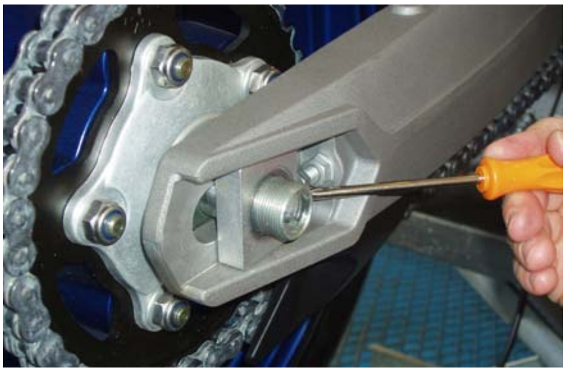




- Loosen the right chain set screw.

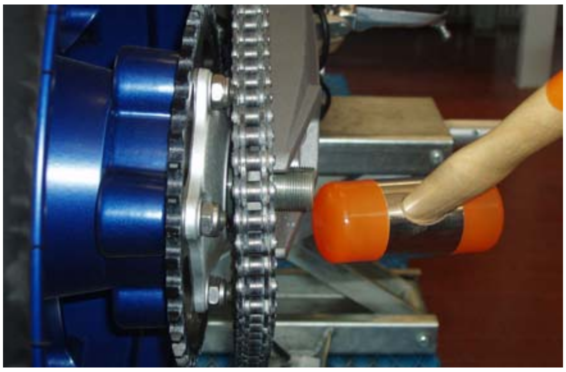


- Remove the spacer.



- Slide off the chain.
- Slide off the pin with the aid of a plastic hammer, supporting the rear wheel.
- Remove the rear tyre.





Checking the rear wheel

CHECK THAT ALL THE PARTS ARE IN GOOD CONDITIONS, ESPECIALLY THOSE MENTIONED BELOW.

REAR WHEEL BEARINGS

Carry out the check with the bearings fitted on the wheel.

ROTATION CHECK

- Manually rotate the inside ring of each bearing. Rotation must be constant, smooth and noiseless.

If one or both bearings do not fall within the control parameters:

- Replace both wheel bearings.

ALWAYS REPLACE BOTH BEARINGS.
ALWAYS REPLACE THE BEARINGS WITH OTHERS OF THE SAME TYPE.

- Check the radial and axial clearance.

Axial clearance: a minimum axial clearance is allowed.

Radial clearance: none.

If one or both bearings do not fall within the control parameters:

- Replace both wheel bearings.

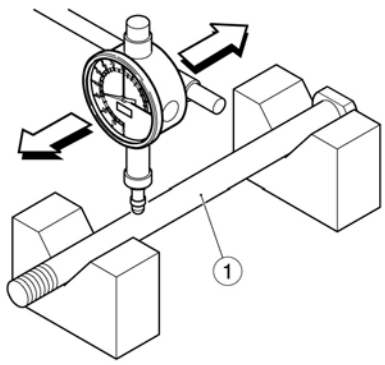
REAR WHEEL GASKETS

- Check that the gaskets are in good conditions; replace them if they show signs of damage or excessive wear.

ALWAYS REPLACE BOTH GASKETS.
ALWAYS REPLACE THE GASKETS WITH OTHERS OF THE SAME TYPE.

REAR WHEEL PIN

- Using a dial gauge, check the wheel pin eccentricity (1). If the eccentricity exceeds the limit value, replace the wheel pin (1).



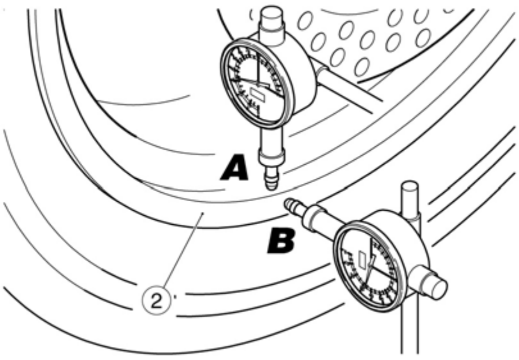
Characteristic

Maximum eccentricity:

0.25 mm (0.0098 in)

REAR WHEEL RIM

- Using a dial gauge, check that the radial (A) and the axial eccentricity (B) of the rim (2) do not exceed the limit value.



An excessive eccentricity is usually caused by worn or damaged bearings. Replace the rim (2) if after replacing the bearings, the value is not within the specified limit.

Characteristic

Maximum radial and axial eccentricity:

2 mm (0.0079 in)

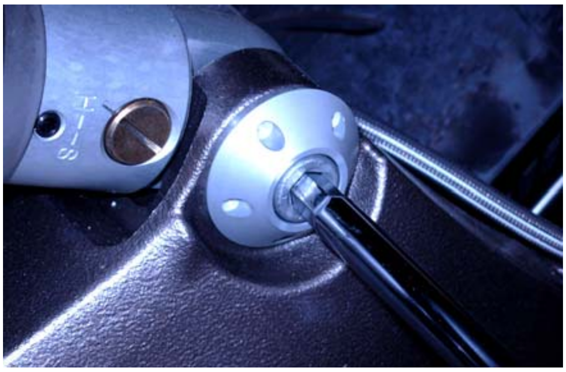
Shock absorbers

Removing

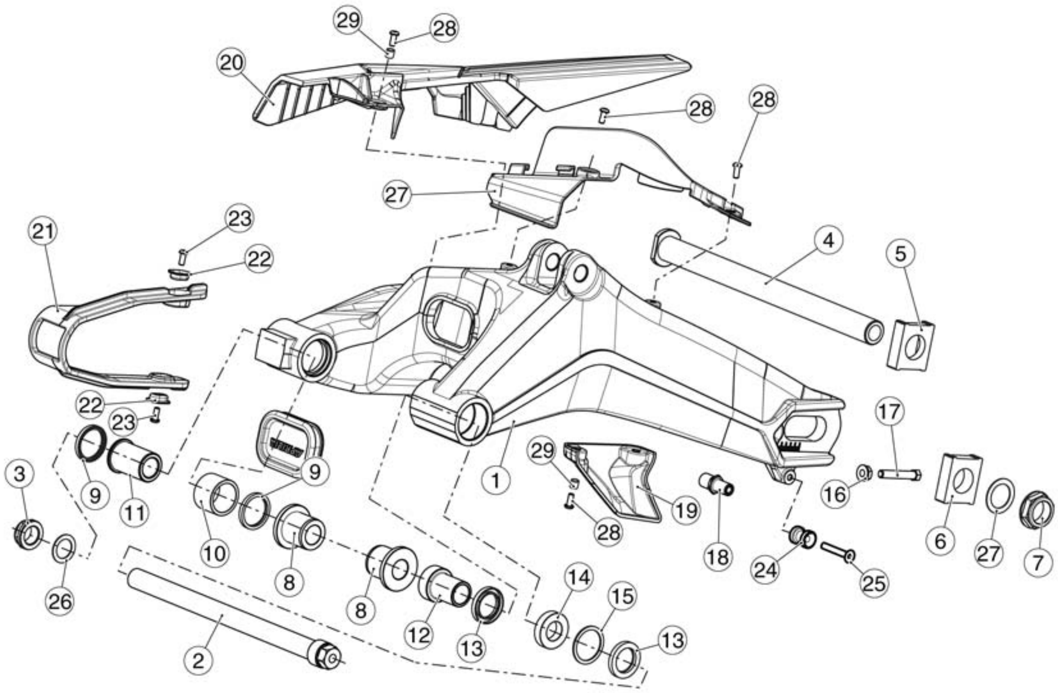
- Place the vehicle on the service stand under the oil sump carefully.
- Undo and remove the front shock absorber fixing screw and collect the collar.



- Undo and remove the rear fixing screw and collect the collar.
- Remove the rear shock absorber.



Swinging arm



Key:

1. Swing arm
2. Swing arm pin
3. Nut M20x1.5
4. Rear wheel pin
5. Right chain tensioner
6. Left chain tensioner
7. Rear wheel nut
8. Engine bushing
9. Sealing ring
10. Roller casing 30x37x26
11. Fork right internal spacer
12. Fork left internal spacer
13. Sealing ring
14. Ball bearing 20x37x9
15. Safety ring for holes
16. Nut
17. Chain tensioner set screw

18.Brake calliper support locking pin

19.Chain lower crankcase

20.Chain guard

21.Chain slider

22.Slider cap

23.TBEI screw 5x12

24.Stand rear bushing

25.TSPEI screw M6x55

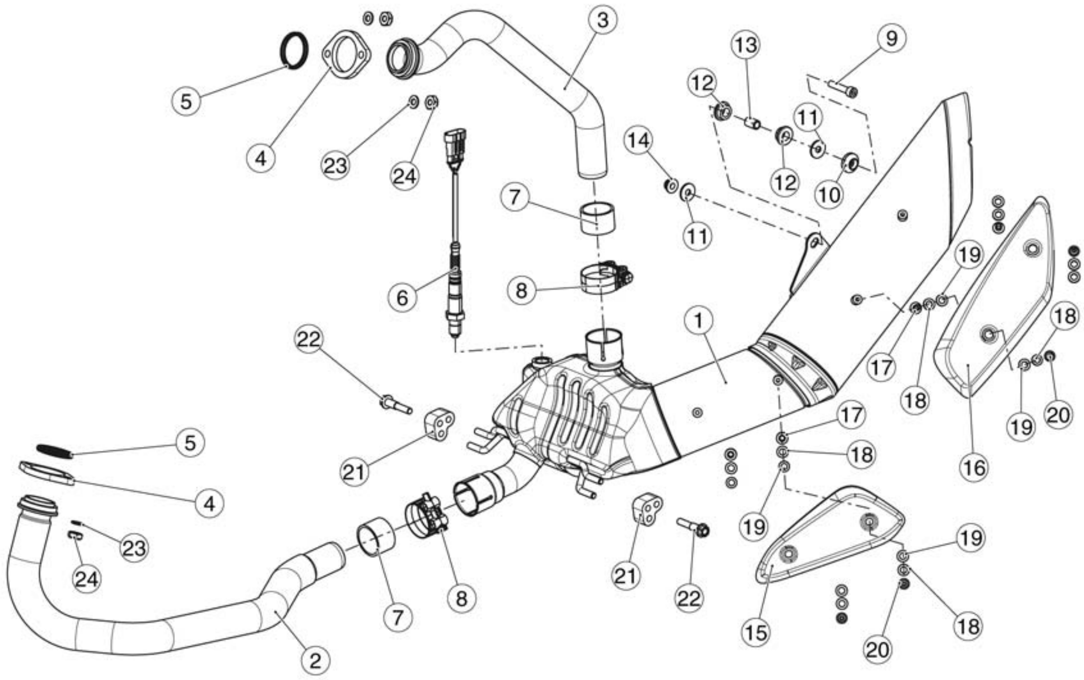
26.Washer 20x29x1

27.Rear brake hose guide

28.M5x15 TBEI screw with washer

29.T-shaped bushing

Exhaust



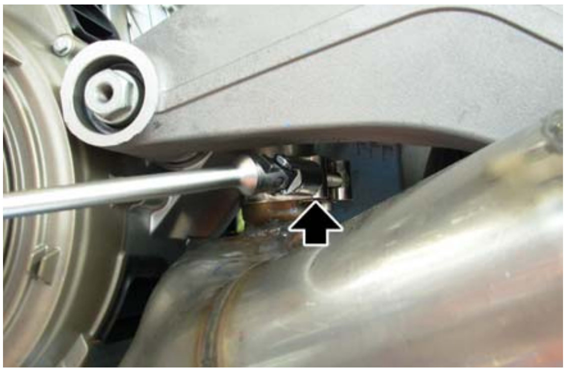
Key:

1. Silencer
2. Front manifold
3. Rear manifold
4. Flange
5. Sealant

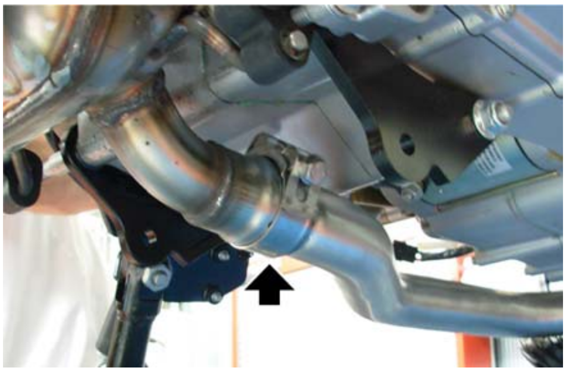
6. Lambda probe
7. Bushing
8. Clamp
9. TCEI screw M8x40
10. Silencer fixing bushing
11. Washer
12. Rubber ring
13. Spacer
14. Flanged self-locking nut M8
15. Exhaust protection
16. Silencer protection
17. T-shaped bushing
18. Graphite bushing
19. Rubber washer
20. Flanged TBEI screw
21. Rubber ring
22. M10 Compensator fixing screw
23. Washer for shafts D8
24. Flanged metalbloc self-locking nut

Removing the tail pipe

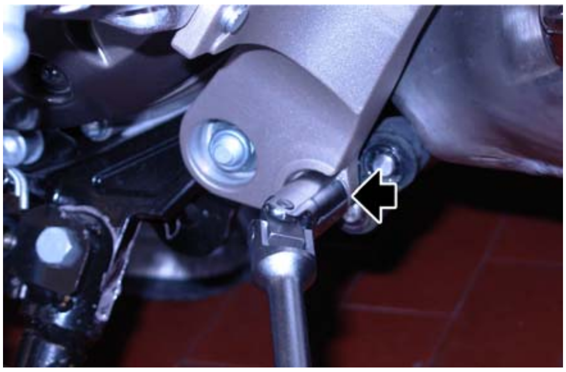
- Loosen both sealing clamps.



- Remove the front exhaust manifold.



- Operating from both sides, undo and remove the screw on the plate.



- Undo and remove the muffler tip fixing screw.
- Remove the muffler tip.





Removing the exhaust manifold

FRONT CYLINDER MANIFOLD

- Loosen the nut tightening the clamp.
- Move the clamp.



- Remove the exhaust manifold of the front cylinder.



REAR CYLINDER MANIFOLD

- Loosen the nut tightening the flange.
- Move the flange.

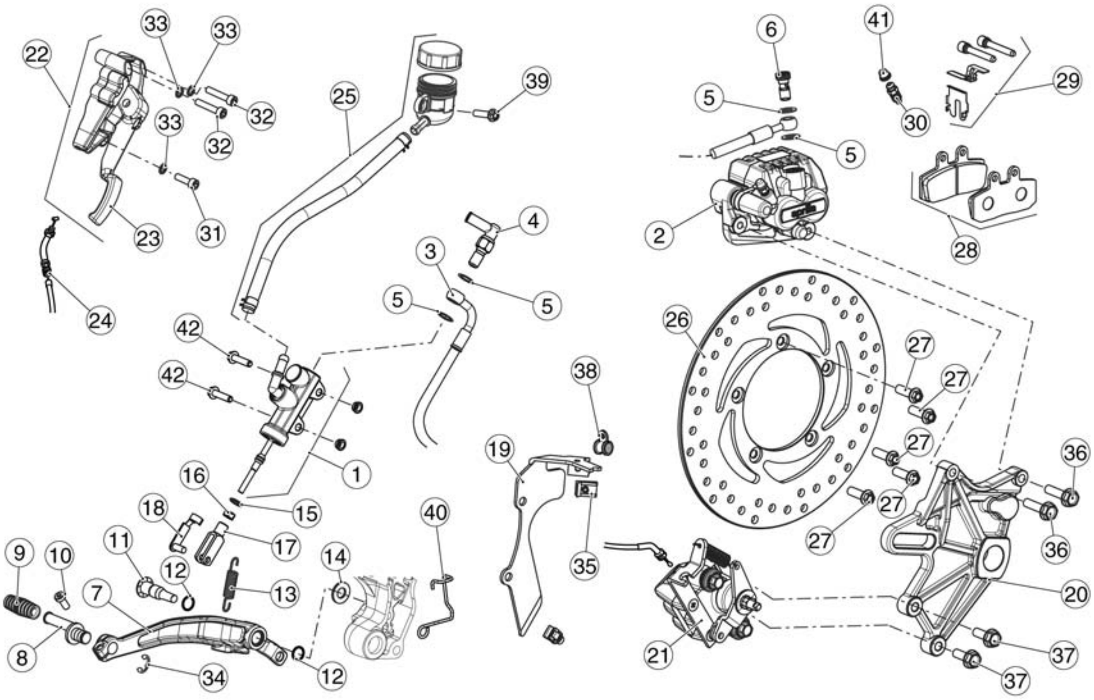


- Remove the exhaust manifold of the rear cylinder.



INDEX OF TOPICS

Rear brake calliper



Key:

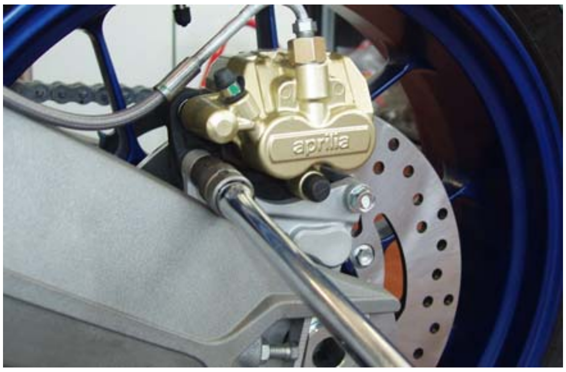
1. Rear brake pump
2. Rear brake calliper
3. Rear brake pipe
4. Hydraulic stop switch
5. Copper washer
6. Oil pipe screw
7. Rear brake lever
8. Brake lever pin
9. Brake lever rubber ring
10. TCEI screw M6x20
11. Lever pin
12. O-RING
13. Spring
14. Washer
15. O-RING
16. Nut
17. Fork M6

18.Fork clip
19.Rear brake pipe support
20.Rear calliper support bracket
21.Parking calliper
22.Parking brake lever unit
23.Parking brake lever
24.Parking brake control complete transmission
25.Complete rear brake oil tank
26.Rear brake disc D.260
27.TE flanged screw M8x20
28.Rear brake pad torque
29.Rear brake calliper pin and springs
30.Bleeding Kit
31.TCEI screw M6x20
32.TCEI screw M6x30
33.Notched washer 6.4x11xh.0.7
34.Ring
35.Clip M5
36.Screw M8x29
37.Screw M8x21
38.Cable guide
39.TE flanged screw M6x16
40.Cable guide
41.Cap
42.Brake pump fixing screws

Removal

REAR BRAKE CALLIPER

- Undo and remove both rear brake calliper fixing screws.
- Remove the rear brake calliper.



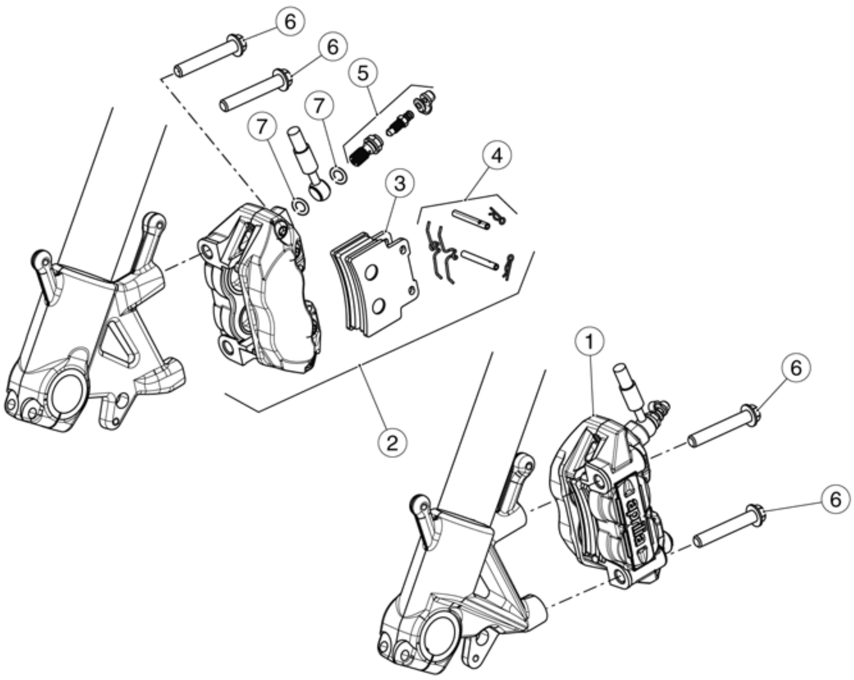
PARKING BRAKE CALLIPER

- Release the control cable.
- Undo and remove both parking brake calliper fixing screws.
- Remove the calliper.





Front brake calliper



Key:

1. Left front brake calliper

2. Front brake calliper
3. Front brake pads - pair
4. Pin + calliper spring
5. Bleeding Kit
6. TE flanged screw M10x1.25x55
7. Copper washer

Removal

- Turn the pins and remove both split pins.



- Remove both pins.



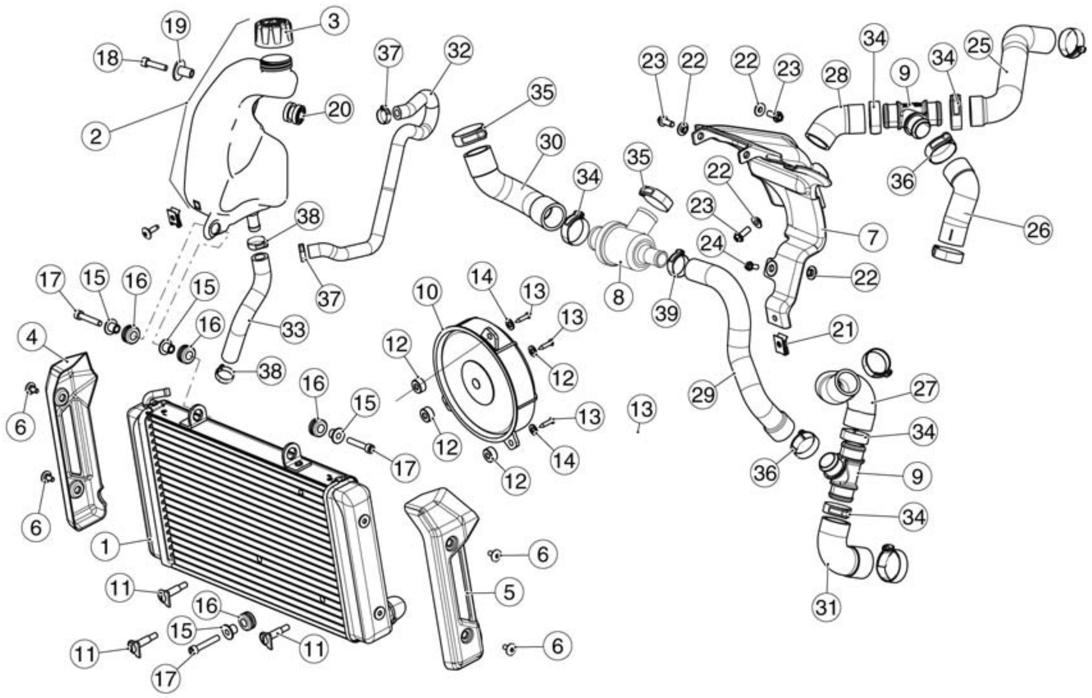
- Collect the anti-vibration springs.
- Extract one pad at a time.

CAUTION

AFTER REMOVING THE PADS, DO NOT OPERATE THE BRAKE CONTROL LEVER OR THE CALLIPER PLUNGERS COULD GO OUT OF THEIR SEATS RESULTING IN BRAKE FLUID LEAKS.

INDEX OF TOPICS

Circuit diagram



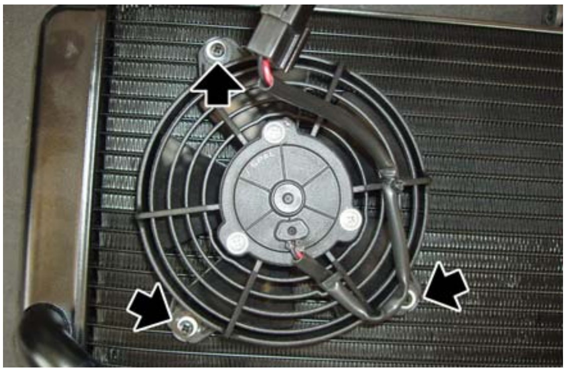
Key:

1. Water radiator
2. Complete expansion tank
3. Expansion tank cap
4. Radiator right cover - silver crowd v.
5. Radiator left cover - silver crowd v.
6. TBEI screw - M5x12
7. Radiator heat protection
8. 75°C thermostat valve unit
9. H20 pipe union tee
10. Electric fan
11. Fan pin
12. Electric fan spacer
13. Pin fixing screw
14. Washer
15. T-shaped bushing
16. Anti-vibration rubber ring
17. TCEI screw - M6x35

18.TCEI screw - M6x25
19.T-shaped bushing
20.Anti-vibration rubber ring
21.Clip M6
22.T-shaped bushing
23.Screw M6x16
24.Screw M5x10
25.Rear head Y
26.Front head - joint pipe
27.Radiator pipe - joint
28.Joint - thermostatic valve pipe
29.By-pass pipe
30.Radiator - valve pipe
31.Pump pipe
32.Bleed pipe
33.Radiator - expansion tank pipe
34.Clamp clic D35-33
35.Clamp clic D31 white
36.Clamp clic D29x8.9
37.Clamp clic D13.5 white
38.Clamp clic D17.5 white
39.Clamp clic D24.5x8.6

Electric fan

- Remove the radiator.
- Undo and remove the three electric fan fixing screws.
- Remove the electric fan.

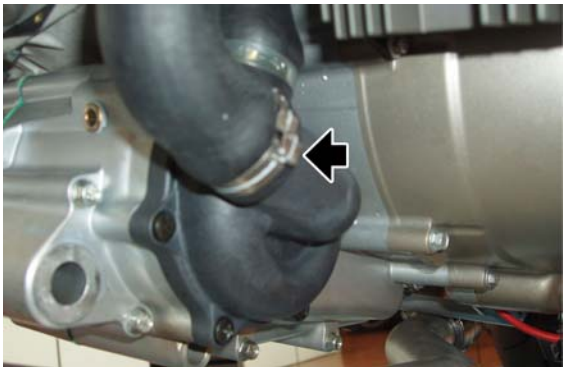


Coolant replacement

- Remove the expansion tank cap.
- Place an appropriate container near the water pump.



- Remove the clamp and slide off the manifold.
- Drain off the system.



TOPPING UP

- Place the sleeve and tighten the seal clamp.
- For topping up, follow the system bleeding procedure.

See also

System bleed

System bleed

- Place a container under the rear bleed valve.
- Unscrew the expansion tank closing cap.
- Loosen the rear bleed valve screw and start the engine.
- Keep the screw open until coolant flows constant, so as to make sure that air bubbles have been eliminated.
- Screw the bleed screw again.
- Stop the engine.
- Top up the expansion tank fluid level and close the expansion tank closing cap.
- Start the engine and leave it running to warm up until the electric fan triggering temperat-

ure is reached.

- Shut off the engine.
- Wait until the engine cools down.
- Restore the expansion tank fluid level.

Water pump - overhaul

- In order to work on the water pump shaft and the corresponding oil seal, it is necessary to open the engine crankcase, and work from inside the transmission-side crankcase half.
- Slide off the idle gear.



- Slide off the water pump control gear together with the shaft.



- Undo the two indicated screws and remove the gear protection plate.



- Introduce a punch on the water pump shaft seat and remove the oil seal.



See also

Splitting the crankcase halves

- Fit the oil seal from the outside being careful not to grease the contact surfaces.
- Operate on the specific tool until it stops.

Specific tooling

020663Y Water pump shaft oil seal punch



- Fit the plate in its position and lock it by tightening the two screws to the prescribed torque.

Locking torques (N*m)

Water pump gear protection plate tightening screws 3 ÷ 4 Nm (2.21 ÷ 2.95 lbf ft)



- Fit the water pump shaft together with the control gear.



- Fit the idle gear.



Entire sealing fitting

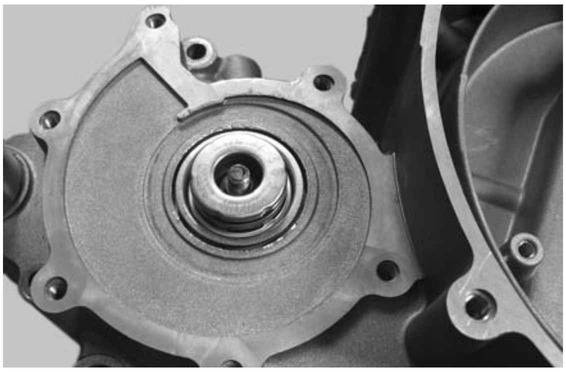
CAUTION

CLEAN ALL THE COMPONENTS CAREFULLY.

CAUTION

LUBRICATE THE ROTOR SHAFT WITH OIL.

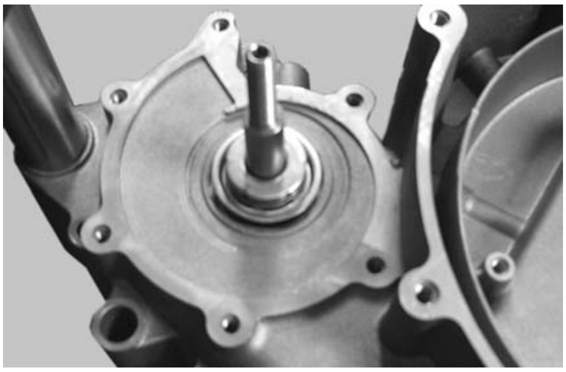
- Place the entire sealing on the shaft.



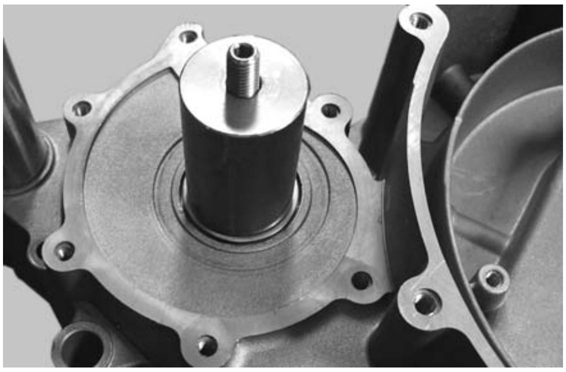
- Fit the tie rod screwing it in the rotor shaft.

CAUTION

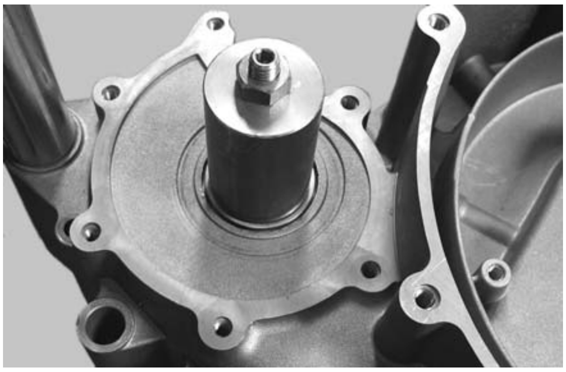
THE SHAFT THREAD IS ANTICLOCKWISE, SCREW IT MANUALLY UNTIL IT STOPS.



- Place the calibrated punch (with preloading values).



- Apply the nut to the tie rod.



Lock the tie rod and screw the nut until the end of stroke.

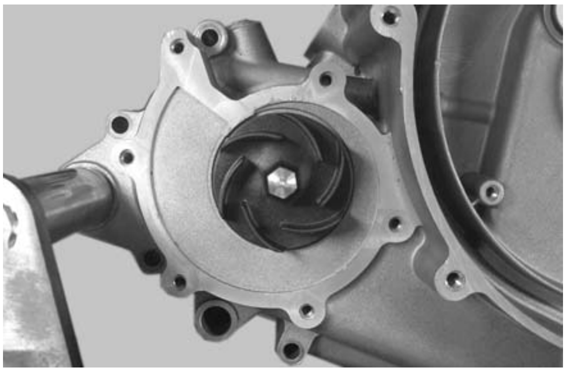
The tool the will fit the static seat on the crank-case and the movable seat on the shaft, producing the correct ceramic seal preloading.



- Screw the rotor. (anticlockwise thread).

Locking torques (N*m)

Water pump rotor 4 ÷ 5 Nm (2.95 ÷ 3.69 lbf ft)



- Fit the pump cover with a new gasket, previously lubricated with petroleum jelly grease.
- Screw the six cover screws and tighten to the

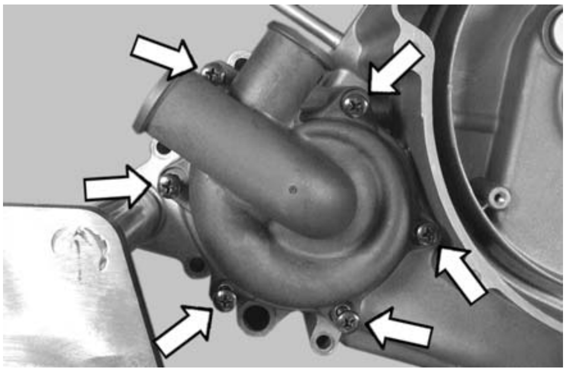
prescribed torque.

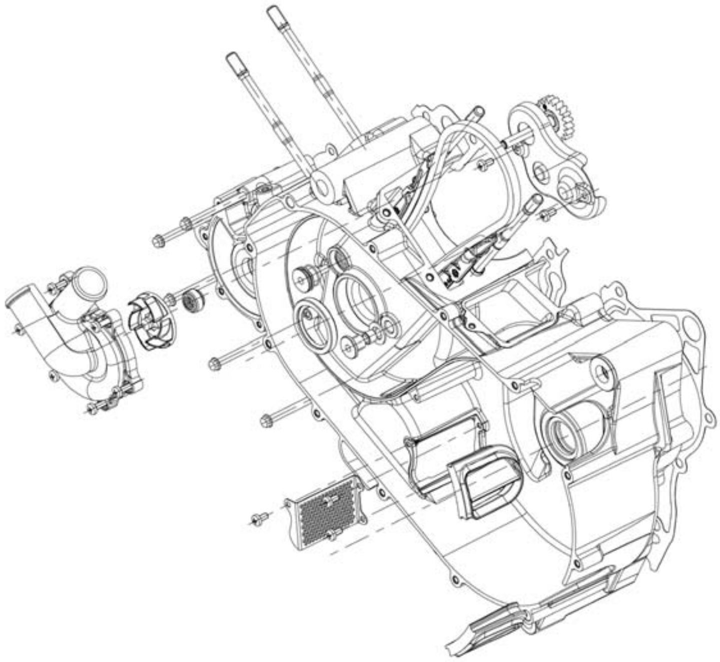
NOTE

DO NOT LUBRICATE THE O-RING WITH PETROLEUM GREASE TO AVOID DEFORMATION.

Locking torques (N*m)

Water pump rotor cover 3 ÷ 4 Nm (2.2 ÷ 2.95 lbf ft)





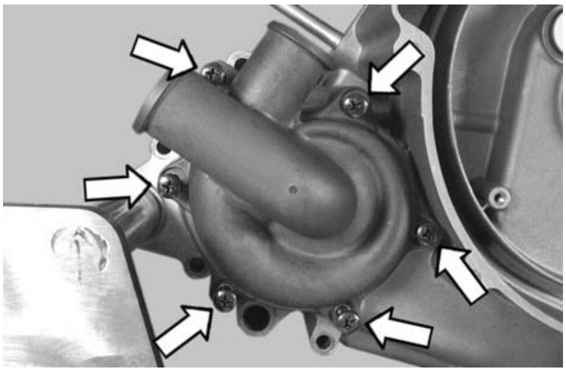
NOTE

OVERALL SEAL REPLACEMENT CAN BE CARRIED OUT WITH ENGINE ASSEMBLED ON THE VEHICLE.

Specific tooling

020661Y Water pump overall seal replacement kit

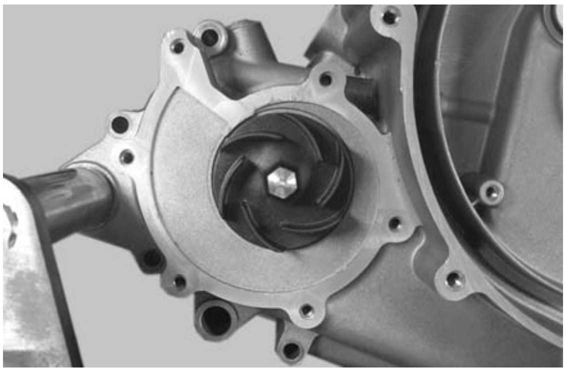
- With a screw remove the six screws and the water pump cover and the gasket.



- With a 10-mm wrench, unscrew the water pump rotor.

CAUTION

THE ROTOR THREAD IS ANTICLOCKWISE. THE PUMP SHAFT FACILITATES REMOVING THE ROTOR AS THE GEARED CONTROL CANNOT ROTATE IN REVERSE SENSE.

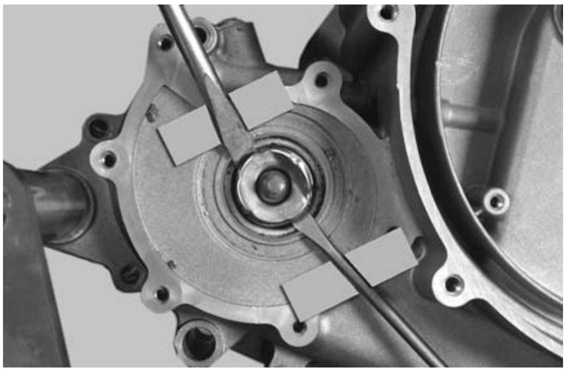


- Use two flat blade screwdrivers, and place them as shown in the figure so as to lever on the marked crankcase edge and disassemble the overall seal, pressure-fitted on the rotor shaft.

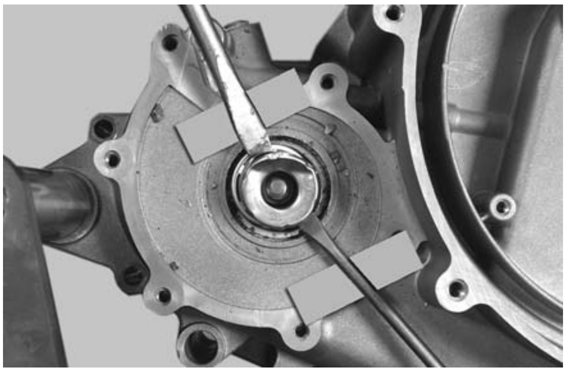
CAUTION

USE TEFLON AS SHOWN IN THE FIGURE SO AS NOT TO DAMAGE THE WATER PUMP COVER SEALING SURFACE.

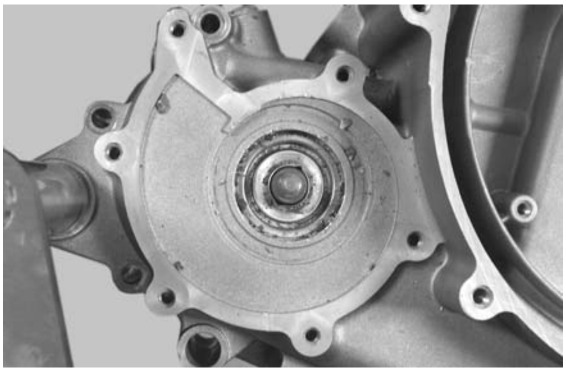
Small scratches on the seat edge do not present functional problems.



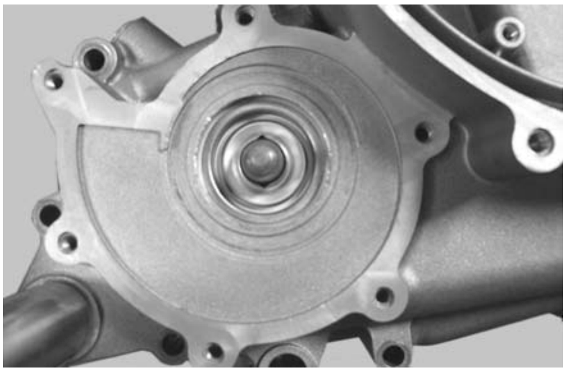
Change the position of the screwdriver if necessary.



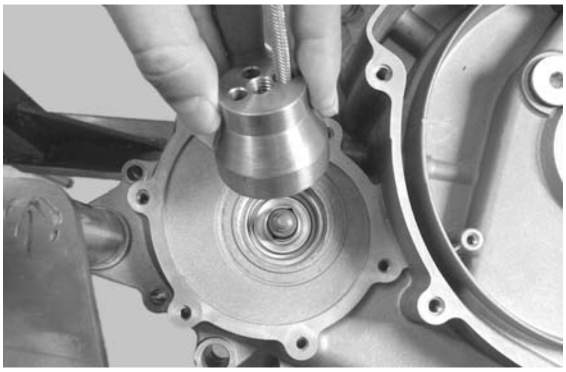
During seal disassembly, the ceramic may split.



- Before removal, clean thoroughly all the parts.



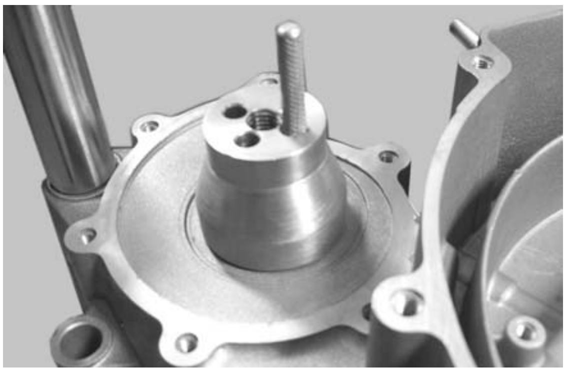
- Place the extractor complete with pin on the static part of the ceramic seal.



- Without modifying the extractor position, make three holes on the static part of the seal using the pin supplied and a hammer.

NOTE

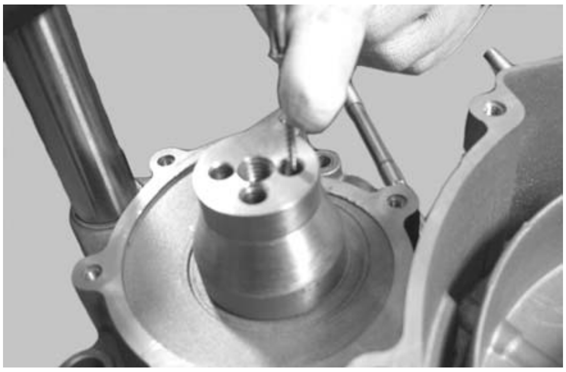
MAKE THE HOLES WITH A STRONG HIT. MULTIPLE BLOWS COULD DEFORM THE PART WITHOUT PASSING THROUGH.



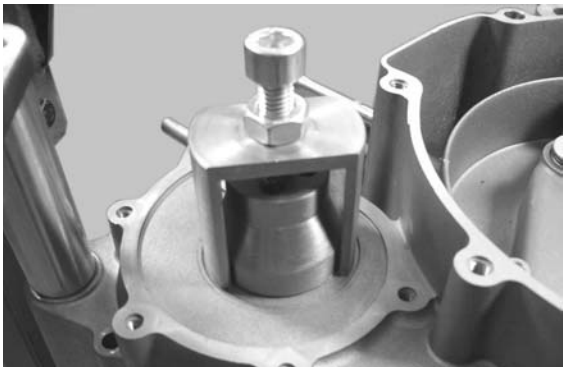
- Fasten the extractor to the static part of the sealing, using the screws supplied with the tool.

CAUTION

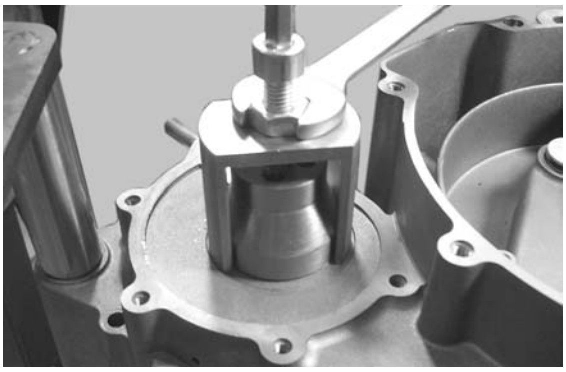
FASTEN IT CORRECTLY WITHOUT "TEAR-ING" THE PLATE



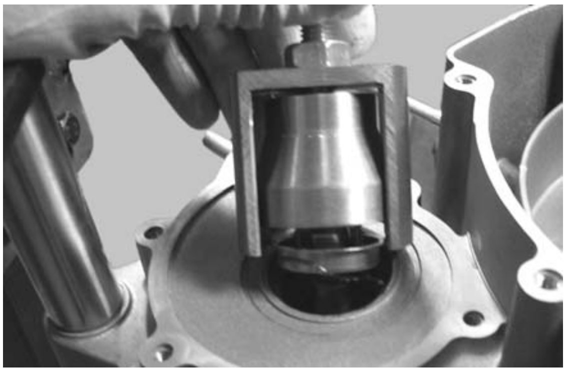
- Complete the tool by fitting the bracket, screw and the nut.



- Hold the screw in one position and operate the nut until the static part of the sealing is completely removed.



- Remove the extractor with the static part of the entire sealing.



Removing the radiator

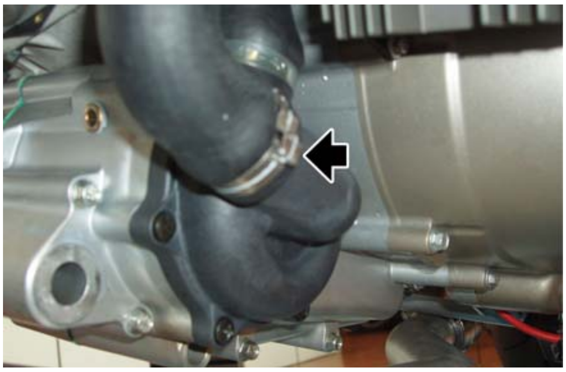
- Remove the right side fairing.
- Undo and remove the two protection fixing screws.
- Remove the protection.



- Remove the expansion tank cap.
- Place an appropriate container near the water pump.



- Remove the clamp and slide off the manifold.
- Drain off the system.



- Remove the clamp.
- Release the sleeve.



- Undo and remove the fixing screw.



- Disconnect the electric fan connector.



- Undo and remove the radiator lower fixing screw.

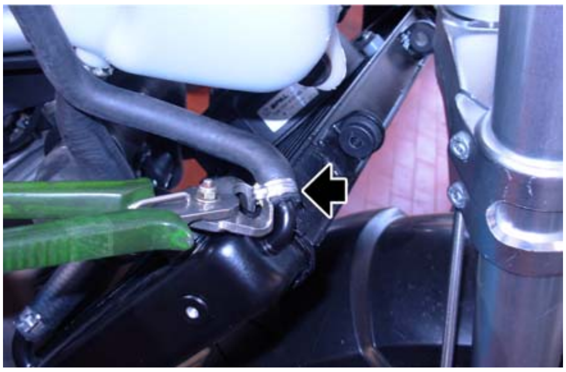


- Release the sealing clamp of the radiator lower pipe.



- Release the sealing clamp of the expansion tank upper pipe and release

the pipe.



- Release the sealing clamp of the expansion tank lower pipe and release the pipe.



Removing the expansion tank

- Right bottom side removal.
- Drain off the system.
- Undo and remove the fixing screw.



- Undo and remove the fixing screw.



- Release the clamps and slide off the two sleeves.



